ROADS and STREETS

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HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

A GILLETTE PUBLICATION

Gillette Publishing Co., 22 West Maple St., Chicago 10, Illinois • Accepted as Controlled Circulation Publication at Milwaukee, Wis.

Concrete Turnpike in Texas...page 32

Shootin' a Mountain to Grade a 4-Lane Highway...page 52
Aluminum's Growing Role in Roadbuilding...page 70
New Fast Survey Method Uses Radar...page 87

December 1957

still going strong...

Eight years of tough, continuous operation—with minimum care and maintenance—yet this Chrysler-powered Pettibone Mulliken Speedloader has never failed to meet a work day schedule.

"We use it mostly for loading pea gravel," says J. L. Pharr, Supervisor Shop #3, Dallas (Texas) County Road Commission, "but at one time or another it's been used for almost everything—even hauling 48" concrete pipe. It hasn't been treated with any respect, either. Everybody but the bookkeeper has operated it . . . and any machine used like that has a right to break down *but this one hasn't!* In fact, on any of the equipment we operate we've never had a Chrysler Engine fail!"

CHRYSLER INDUSTRIAL 33, in-line 6 (265 cu. in. displacement) Engine powers many makes of equipment in the construction and materials handling fields. There are four Chrysler in-line 6s, two V-8s—ranging from 230 to 354 cu. inch displacement. For detailed information about Chrysler Industrial Power, write: Dept. G12, Industrial Engine Division, Chrysler Corporation, Detroit 31, Michigan.

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INDUSTRIAL ENGINES

INDUSTRIAL ENGINE DIVISION • CHRYSLER CORPORATION

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Turnpike Interchange

The Mahoning Valley Interchange of the Northeastern Extension of Pennsylvania Turnpike links the turnpike with U. S. Route 209. It is one of the major construction jobs along the four-lane superhighway which connects the port and industrial facilities of Philadelphia with the anthracite coal regions and Pocono Mountain resort sections of the North.

Bethlehem, which is well represented on all sections of the Pennsylvania Turnpike, supplied dowel units, reinforcing steel, bar mats and other highway steels for the road bed. In addition, Bethlehem structural shapes were used in the construction of bridges and overpasses, and Bethlehem guard rail protects motorists and truckers along many miles of the highway.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

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ROADS AND STREETS

A GILLETTE PUBLICATION • DECEMBER, 1957 • VOLUME 100 • NUMBER 12

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Continuing Rock Excavation Series

When and how contractors are using the large tractor-mounted drills . . . Rock methods on grading projects in Wyoming, Idaho, New York, and New Mexico.

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What contractors got the largest job load in the highway program? The largest individual contracts? A staff summary.

Handling Traffic Through the Job

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Aggregates in the Road Program

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Accepted as Controlled Circulation Publication at Milwaukee, Wisconsin. Published monthly. Subscription $5.00 per year.

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Specify Goodyear 3-T Nylon Cord

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NOW IN 3-T NYLON CORD—
TUBELESS OR TUBE-TYPE!

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ROAD LUG

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Just be sure you specify *Goodyear 3-T Nylon Cord* tubeless tires—and see the *Goodyear* dealer about economical change-over of present equipment. Goodyear, Truck Tire Dept., Akron 16, Ohio.

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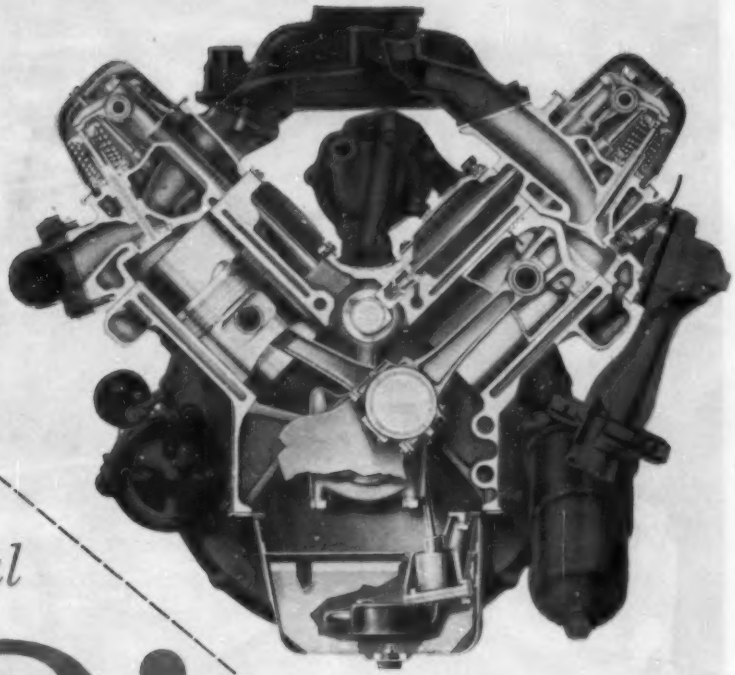

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V-8's

Built to stay on the job longer!

INTERNATIONAL heavy-duty V-8 engines stay on the job long after high stress modified engines have failed to satisfy.

The big difference: INTERNATIONAL V-8's are *built* specifically for rugged, continuous truck operations—and they've proved it since introduction a year ago. Every part, from the heads to the pan, has built-in reserve life. For example: there are exclusive long-life "wet" replaceable exhaust valve guides, fully machined and high efficiency combustion chambers, Y-shaped, deep skirted, rigidly constructed special alloy cylinder block, and many other endurance features that also keep running costs low.

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Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors

International Trucks cost least to own!

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BIG ST. LAWRENCE SEAWAY earth-moving job—improving the channel at Sparrowhawk Point and Toussaints Island—is being done by Merritt-Chapman & Scott. Tough jobs like this are made easier by simplifying lubrication. In fact, all major lubrication can be handled with no more than six lubricants, if you use a Texaco Simplified Lubrication Plan. A Texaco Lubrication Engineer will

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OPERA
radio broadcasts
every Saturday afternoon

TEXACO

TEXACO

show you how it can help you cut lubricant inventory, avoid mistakes, and save both time and money.

Moving millions of yards of earth for the St. Lawrence Seaway... How Texaco helps

Move millions of yards of earth—and do it on schedule—and you prove you've got good equipment and good lubrication, especially when temperatures range from 90° above to 25° below.

Here are some of the ways Texaco Products help keep big earth-moving jobs on the go.

Keeping engines clean. *Texaco Ursa Oil Super Duty* keeps rings free; valves seating properly. You get full compression and complete combustion. And every piece of equipment stays on the job—always at full rated power.

For air compressors and hydraulic mechanisms, use *Texaco Regal Oil R&O*. It keeps compressor systems clean, prevents rust, sludge and foam in hydraulic systems. To reduce the performance cost for differentials and transmissions, use *Texaco Universal Gear Lubricant EP*. For general lubrication, *Texaco Marfak Heavy Duty Special 2* is a multi-purpose grease suitable for wheel bearings, chassis, water pumps and other lubrication.

Ask a Texaco Lubrication Engineer to help you simplify your lubrication and reduce your costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.

Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

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TAKE A QUICK "TOUR" through this Johnson concrete plant:

As you follow the flow of aggregates and cement through this Johnson "one-stop" plant, notice how every operation from receiving of materials to final weigh-out, is carefully coordinated for fast, accurate production:

1 Set up here for truck delivery of aggregates, plant has 5 cu. yd. receiving hopper attached to elevator boot.

2 Open, inclined belt-and-bucket elevator feeds aggregates into overhead chute at rate of 90 tons an hour.

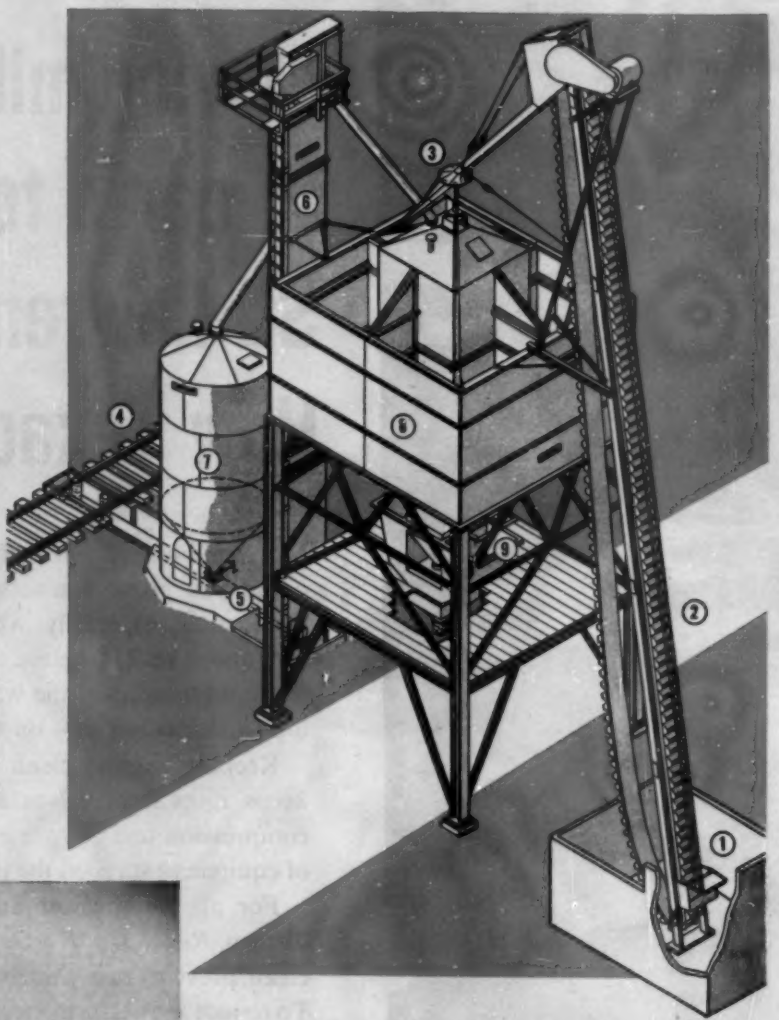
3 Pivoted distributor (manually controlled from ground-level) directs flow of aggregates into proper bin compartment.

4 Canvas shrouds with car-adapter plates unload bulk cement from hopper-bottom cars at rail siding.

5 Undertrack screw conveyor receives cement from rail cars, or ground storage silo, and transfers it to elevator at rate of 275 bbls. per hour.

6 Vertical, enclosed bucket elevator with 2-way discharge gate directs cement into dual-compartment central tank in bin or to auxiliary ground-storage silo. Gate is cable-controlled from ground. Elevator capacity: 275 bbls. per hour.

7 Cement silo has 470-bbl. capacity. Cement rotary plug valve at cone bottom controls flow of reclaimed cement.



8 Johnson prefabricated square bin has a centrally-located 270-bbl. water-tight cement tank, and can be arranged with 4, 5 or 6 aggregate compartments. Total aggregate capacity is 210 cu. yds.

9 Square type Concentric Multiple batcher weighs cement on a separate scale. It can be arranged for handling 4, 5 or 6 aggregates, plus 1 or 2 types of cement — has total capacity of 3 cu. yds.

Note unique bin assembly, which consists of individual, welded sections laid together like blocks, and bolted together. Bin sections do not exceed 11' x 11' x 21' for ease in handling and shipment. Total capacities: 125 to 300 cu. yds. In addition to transit-mix, this plant readily sets up for central-mix or concrete products — manual or push-button control. Want more facts? See Johnson distributor, or write us for 44-page catalog.

C. S. JOHNSON COMPANY J639
CHAMPAIGN, ILLINOIS • *(Koehring Subsidiary)*

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Trenchmobile work schedule:

***Yesterday* — main-line extensions**
***Today* — foundation footings**
***Tomorrow* — service connections**

When it comes to all-around usefulness, Trenchmobile is in a class by itself! It's big enough for digging drainage ditches, sewer services, water and gas main extensions. Yet, it's small enough, fast, and mobile, for efficient operation on curb and building footings, residential service connections, underground cables, and lighting systems. Drives anywhere through town, over highways, or cross-country at 12.6 m.p.h.

Trenchmobile works fast, too. It digs at speeds up to 14½ feet per minute. You get widths from 8 to 16 inches, depths to 5 feet. Positive down-crowd boom starts cut fast in tough materials, holds accurate grade — makes vertical set-ins on lateral connections, undercuts walks, cross-pipes. Self-sharpening "Tap-In" teeth assure top digging efficiency at all times. Shiftable, reversible belt conveyor gives controlled discharge. Trenchmobile also can be equipped with 6-foot blade (optional) — backfills its own trench. You'll find it the handiest trencher you've ever seen! Better have your Parsons distributor demonstrate what it can do for you on general-utility trenching, or on production work. Call him today — or mail coupon for latest Trenchmobile® catalog. For largest sewers, mains, pipelines, check Parsons complete line of big, heavy-duty Trenchliners® — wheel and ladder-types, full crawler mounted.

PARSONS COMPANY, Newton, Iowa *(Division of Koehring)*

Send us: ☐ spec. sheet ☐ catalog on Model 88 Trenchmobile.

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P636 R5

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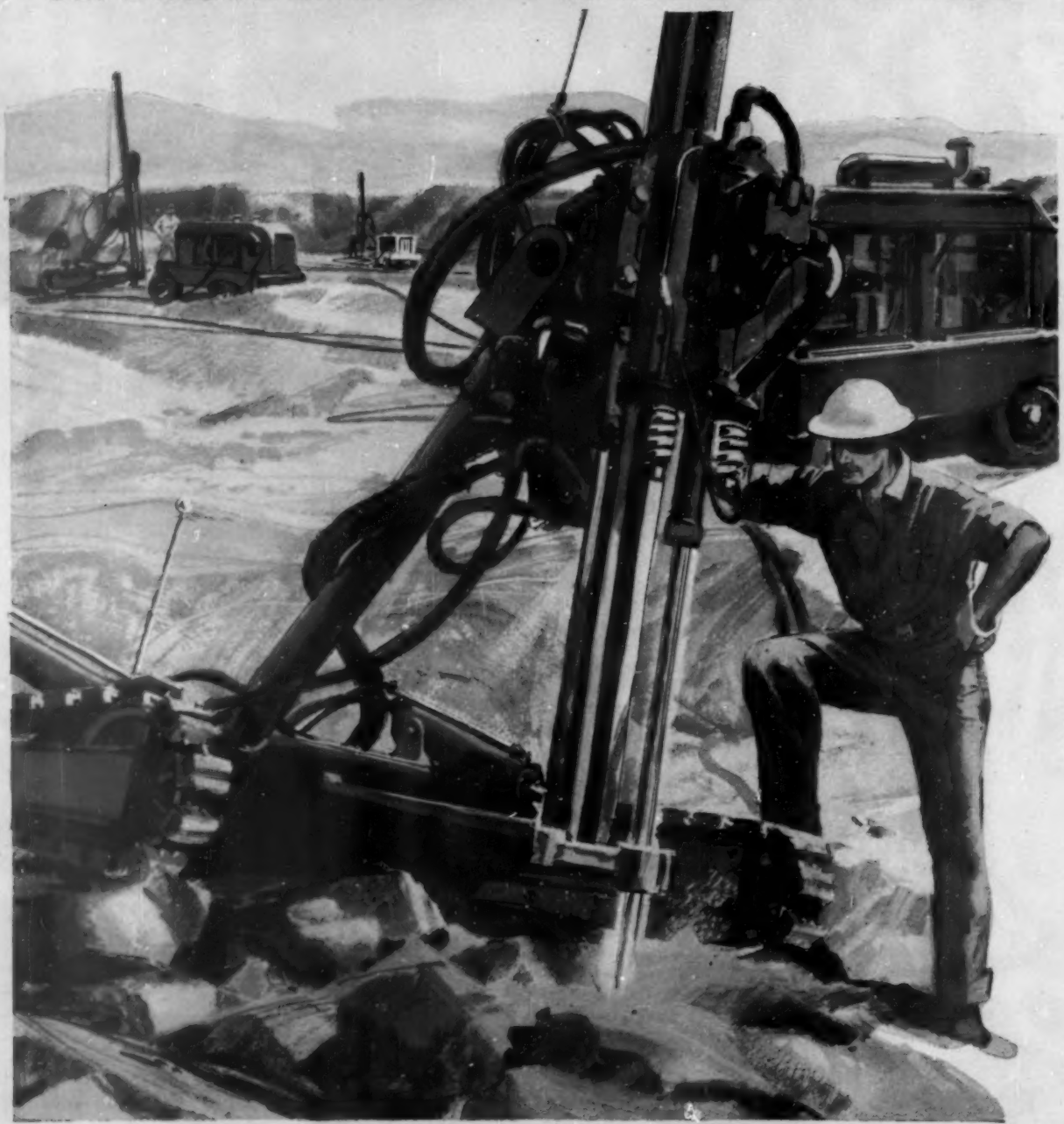
Pick your favorite with a "Jimmy" Diesel

GM DIESEL ENGINES POWER LEADING MAKES



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OF AIR COMPRESSORS AND WELDERS

TODAY the list of contractors who operate—and manufacturers who build—air compressors and electric welders powered by General Motors Diesels reads like a "Who's Who" of the industry.

Operators around the world have found that these modern 2-cycle Diesel engines pack more power in less space and weight—pick up under load faster than 4-cycle engines—deliver a smoother, steadier flow of power that gets work done faster.

These compact engines are designed for easier, lower-cost maintenance. Unit injectors eliminate complex fuel systems and troublesome high-pressure lines. Smaller size makes the GM Diesel more easily accessible for servicing.

Above all, interchangeable GM Diesel parts make it unnecessary to carry large, expensive parts inventories. In the 71 Series, practically all of the wearing parts are interchangeable *regardless of engine model.* This makes it easy to have the right part available when needed—speeds repairs—gets equipment back on the job with less down-time. And GM Diesel parts cost up to 60% less than comparable parts for competitive engines!

The superior performance and dependability of GM Diesels are backed by a world-wide network of distributors and dealers—with complete parts stocks and service facilities readily available throughout the United States and Canada, as well as overseas.

For more information, consult your GM Diesel distributor or write us.

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IT PAYS TO STANDARDIZE ON...

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TS-160

7 yd struck
9.5 yd heaped
155 horsepower
5 speeds to 25.4 mph
12-ton payload

Measure these advantages for a wide range of construction jobs . . .

22 hp per struck yard—Extra lugging ability for tough pulls, fast loading. Teams up with big equipment or works alone, handles a wide range of utility jobs, travels at speeds up to 25.4 mph.

Turns non-stop in less than 25 ft with 90-degree hydraulic steering . . . easy maneuverability in narrow cuts, faster cycles without reversing in tight turn-arounds.

Moves quickly from job to job . . . when required, transport wheels are available to meet legal load limits for highway travel.

Ask your nearby Allis-Chalmers construction machinery dealer for a demonstration now!

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WIS.

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Engineering in Action

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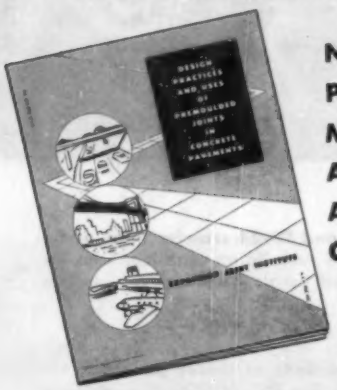
...united to provide research, product development and technical data for the construction industry



NEW "DESIGN PRACTICES" MANUAL AVAILABLE AT NO CHARGE!

The new manual, "Designing Practices And Uses Of Premoulded Joints In Concrete Pavements," features comprehensive technical data and illustrations of premoulded joint types, their applications and installations. Send the coupon below for your copy today!

The Expansion Joint Institute, an association of the major manufacturers of premoulded joint materials, was formed to conduct research in the manufacture, uses and applications of premoulded joint fillers. In addition, the Institute is the collecting, publishing and disseminating body for statistics and information of interest to the Institute members, the building industry and the public. Another objective of the new association is to promote and employ fair and equitable practices calculated to serve the best interests of those engaged in the construction industry who buy and use premoulded joints. The Expansion Joint Institute will cooperate in the adoption and maintenance of uniform and high specification standards in the manufacture of premoulded joint materials.

The newly formed Institute has already produced a manual, the first of its type, in answer to the many requests for a technical manual concerning the use of expansion joints.

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100% INTERNATIONAL®
chosen to highball

To turn miles of prairie and millions of yards of Texas real estate into the Amarillo jet base takes a giant fleet of big-capacity, dirt-delivering equipment!

That's why the contractor, Terra Construction Co., of Great Bend, Kansas, chose International equipment 100% to high-ball this big base!

Texas hardpan boils into "75" Payscraper® bowls with cycle-clipping speed. Highly maneuverable TD-24 tandem pushers not only cut actual loading time, but rely on full-time, exclusive, Planet Power steering to reposition quickly to sharply reduce overall cycle time. And king-sized TD-24 power is instantly adjustable to the load with exclusive on-the-go Hi-Lo shifting!

Terra's International "75" Payscraper fleet makes fast loading count with fast get-away—and travel speeds up to 24 mph! High power-to-weight ratio, load-heaping bowl design, exclusive Hydro-Steer—all help give the Payscraper production-boosting operating ease and safety!

Investigate the advantages of powering-up with an all-International matched crawler-scraper fleet. See how International Payscrapers give you top speed, operating ease, and safety. Find out how International TD-24 Planet Power steering gives you pusher performance unmatched by conventionally-steered crawlers. See your International Construction Equipment Distributor for a demonstration!

Part of the Payscraper and TD-24 crawler fleet on the 100% International-equipped Amarillo air base job. Schedule calls for moving 25,000 cu. yd. per double-shift day—placed on the fill in 3-inch lifts.

To deliver the 40,000 gallons of water per hour—required to compact the dry soil to 95% of original density—the International Distributor came to the contractor's aid and specially modified Model "75" bottom-dump wagons into 5,400-gallon tanks.

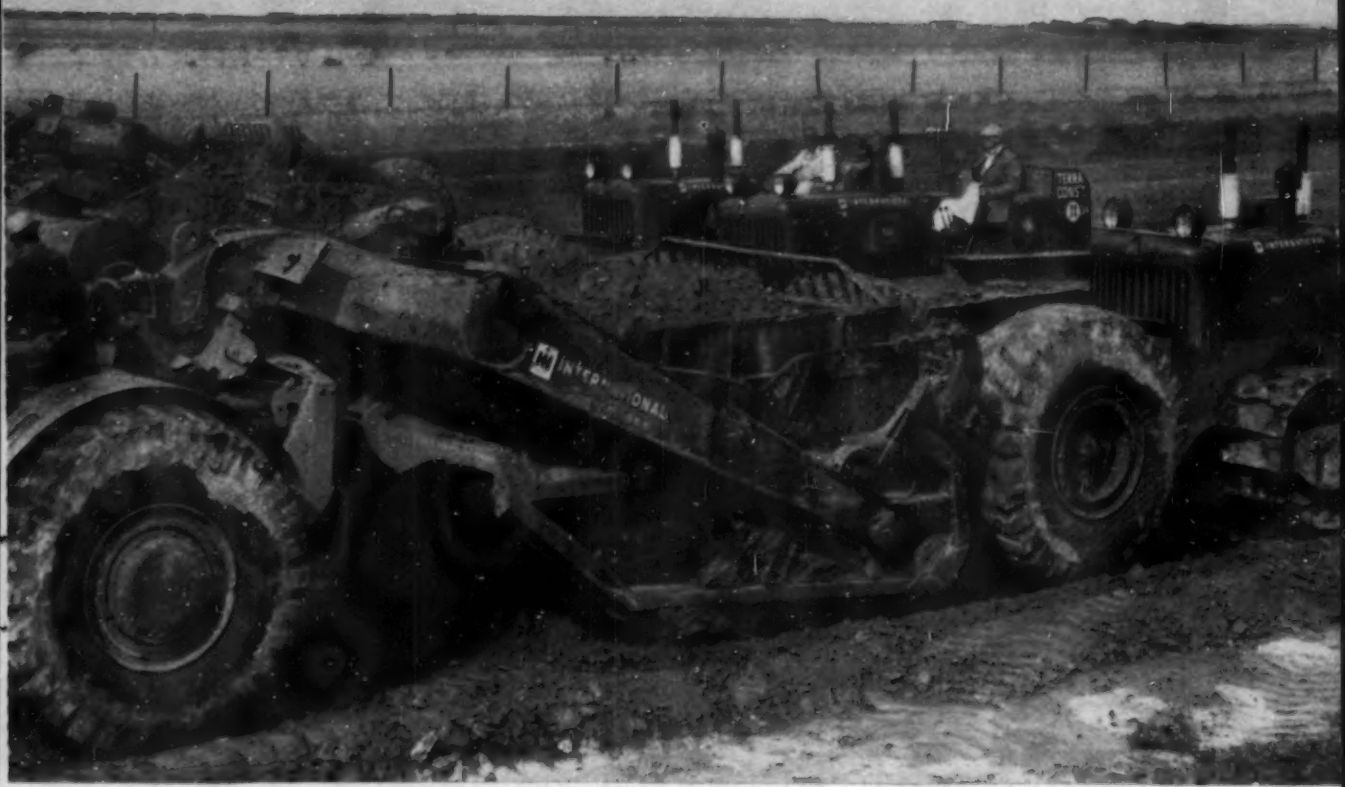
INTERNATIONAL® CONSTRUCTION EQUIPMENT

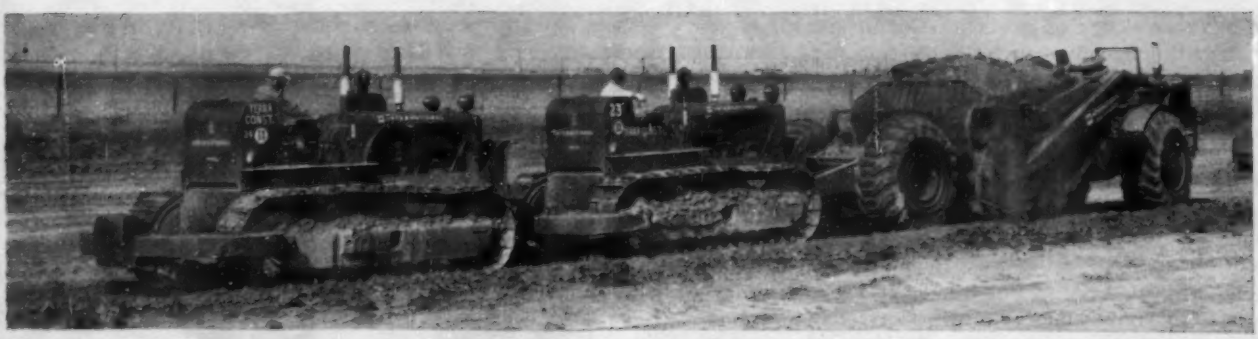
International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

FLEET....

"Texas-Sized" jet base!





Tandem TD-24 pushers profitably overcome the obstacle of loading heat-hardened hard-pan by reducing loading time by 44.4%!

Terra gets an 11.3% production advantage with profit-wise TD-24 tandem push-loading.

	Single TD-24 pusher	Tandem TD-24 pushers
Av. Loading Time:	1 min. 43 sec.	57 sec.
Trips per 60 min. hr.	8.78	9.89
Av. Payload	17.3 cu. yd.	17.3 cu. yd.

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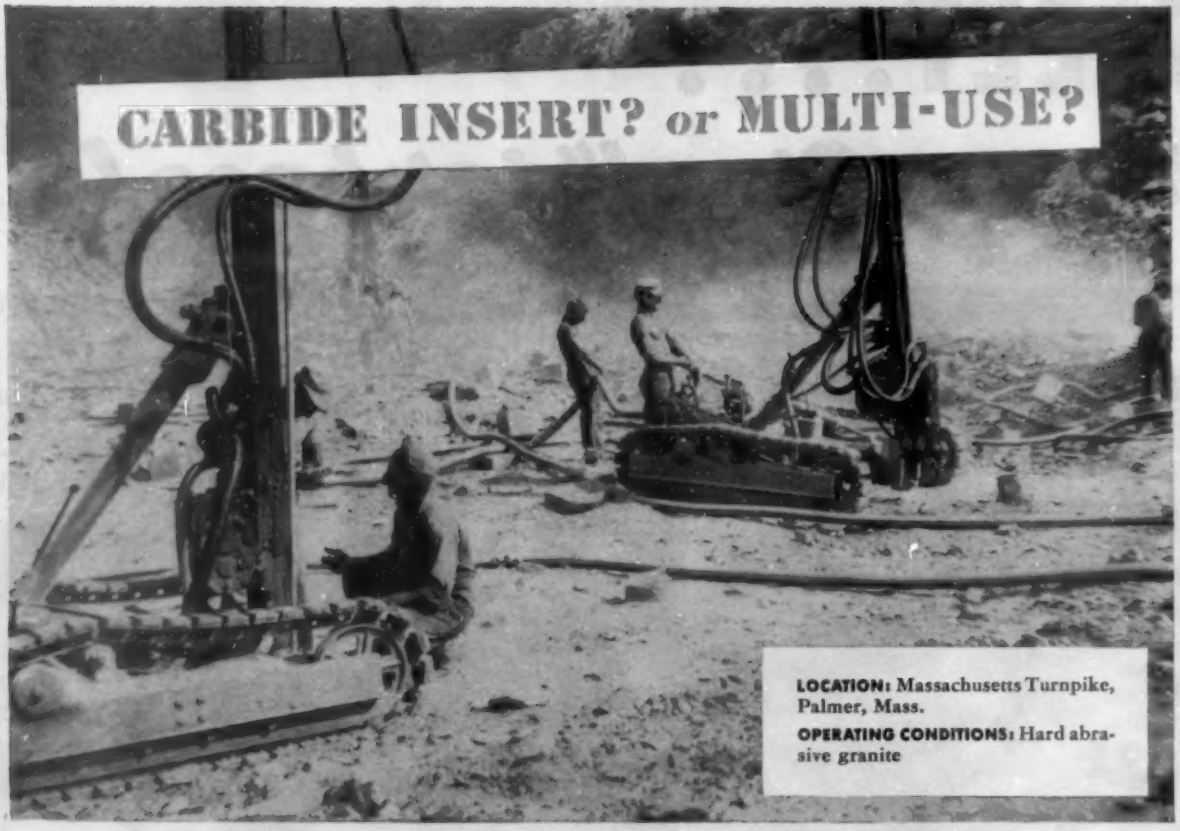
CARBIDE INSERT? or MULTI-USE?
LOCATION: Massachusetts Turnpike, Palmer, Mass.
OPERATING CONDITIONS: Hard abrasive granite

Grandview Construction Corporation speeds deep hole drilling on Mass. Turnpike with Timken® carbide insert bits

GRANDVIEW Construction Corporation had to drill extremely deep holes through hard abrasive granite on its sections of the 123-mile Massachusetts Turnpike. To get speediest drilling at the most economical cost, Grandview used Timken® carbide insert bits. They got maximum production, kept bit cost per foot-of-hole at rock bottom.

For economical drilling in hard, abrasive ground, Timken carbide insert bits are your best bet. But carbide bits may not be the best choice for *every* job.

In ordinary ground, you get more economical results with Timken multi-use bits. Correctly controlled and reconditioned, they give you lowest cost per foot-of-hole when you can drill out full increments of drill steel.

With Timken carbide insert and multi-use bits, your drillers save time. Dozens of different bits fit the *same* drill steel, let you switch bits fast as the ground changes. And both types of bits have a special shoulder union that protects threads against drilling impact.

Timken rock bits are made from electric furnace Timken fine alloy steel. We're America's only rock bit manufacturer that makes its own steel.

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ROADS AND STREETS
Sixty-Five Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk

December 10, 1957

A federal court judge in Philadelphia found last month that a group of 32 Eastern railroads and a New York publicity firm were guilty of conducting "a campaign of vilification" against the trucking industry for the express purpose of destroying it as a competitor in the long-haul transportation business. Here in Washington, where both the truckers and the railroaders maintain large and aggressive lobbying headquarters, the decision has been a Number One topic of conversation among highway people.

For good reason. . . Highway officials were directly implicated by the court in the smear campaign; a number of "good-roads" advocates were fingered as confederates in the railroad cause, and highway engineering data was, the judge said, deliberately distorted to mislead legislators concerned about state highway needs.

* * *

The court's decision is a revelation of the deadly serious struggle between two gigantic national industries and a dismaying spectacle of how a large, unprincipled public relations firm will operate to wield public opinion. The fracas began in 1949, when the Eastern railroads realized they would have to take drastic measures if they were to preserve their virtual monopoly in long-haul transportation. They decided to launch a campaign of publicity against trucks which would inspire public resentment and the passage of tax legislation designed to take the profit out of trucking.

To conduct their campaign they retained an exceedingly slick public relations firm - Carl Byoir & Associates. Among other activities, Byoir's backstage campaign to castigate the truckers included:

- Setting up bogus organizations to conduct "research" on highways and to grind out information twisted to convey the idea that trucks are destroying the nation's roads and do not pay their "fair share" of the cost of construction.

- "Using" highway engineers and other officials as pawns to influence state legislators and so obtain passage of anti-truck legislation.

- Distorting Maryland Road Test results to rouse public opinion against trucks.

The court traced the tentacles of the campaign into several highway departments. In Ohio, the judge found that Former Director T. J. Kauer and his PR director "were working diligently for the interests of the railroads." The New York publicity firm was credited with furnishing the data and the props for Governor Lausche's successful campaign for election on the basis of the ton-mile tax. Byoir claimed credit for, and was reportedly paid for, inspiring or actually writing the rash of anti-truck editorials and articles that appeared in leading national publications - Saturday Evening Post, Readers Digest, Harpers, Parade, and others.

(continued on next page)

Former State Roads Commission officials in Maryland were also accused of working hand-in-glove with the Byoir organization. Such links with highway engineers paid off handsomely in the case of the Maryland Road Test. A copy of the test's tentative findings was in Byoir's hands before it was released even to the highway engineering profession. Within days, and long before the research committee was ready to announce its findings, highway men read Byoir's distorted version of the results "planted" in Newsweek magazine.

Herbert Fairbank, then the highly respected director of research for the Bureau of Public Roads, "was fooled by Byoir and tricked into approving" a distorted movie film on the big test project, the court found. This version, heavily weighted against trucks, became a major weapon in the railroad arsenal. Truckers say that innumerable highway officials, along with the general public, fell prey to the propaganda turned out by the Byoir organization and that it may be years before some of the prejudices produced by this glib presentation die out even in professional engineering circles.

* * *

In Pennsylvania, the judge said, a former chief engineer urged the governor to veto a bill easing truck weight restrictions. His statistical ammunition, the judge found from the evidence, came from a phony front organization created by the Byoir firm for just such purposes. "Cappy" Thomson, secretary of the Pennsylvania State Association of Township Supervisors, became a willing member of the railroad team. A Byoir staff man took up quarters in the Pennsylvania Grange and masqueraded as a Grange representative in producing newspaper and radio propaganda.

The trucking industry is no stranger to alley scraps and needs no sympathy in this case. They weren't awarded the $250 million damages they originally sought, having waived that consideration to win an early decision. But they succeeded in exposing one of the dirtiest fights in the history of American industry. The involvement - voluntary or involuntary - of highway engineers in such a classic example of the "Big Lie" technique is extremely dismaying. This is without question, only the first chapter in what will be a life-and-death struggle between two huge transportation systems. The competitive edge which the fast new highways will give the truckers must have railroad interests working overtime to hold their ground. And they will force a re-evaluation of the road program at the first opportunity.

Meanwhile, the $23 million AASHO road test is under way. The big research project will indicate just how much trucks really do damage roads. Millions of dollars will be riding the outcome. One can't help wondering if the findings from this most important of all road tests will be given to the American people by the highway engineers - the truckers - or the railroads.

* * *

Hundreds of highway specialists came together in Chicago last month to participate in one of the "meatiest" conventions sponsored by the AASHO. After the Congressmen put in their licks on the opening day, the engineers holed up in committee rooms for some 44 committee meetings scheduled throughout the 5-day convention. Most popular sessions were those devoted to the knotty problems of public hearings, traffic and right-of-way acquisition.

Outsiders would have been impressed by the wide range of problems besetting the highway engineers in nudging the big roadbuilding program into high gear - and by the conscientiousness with which the delegates were attacking them. (Next month's issue of Roads and Streets will carry a complete round-up of convention highlights.)

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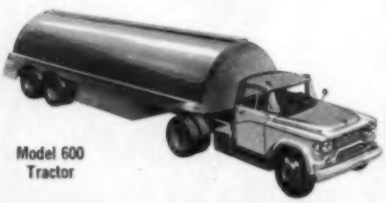
W500
Chassis



Model 600
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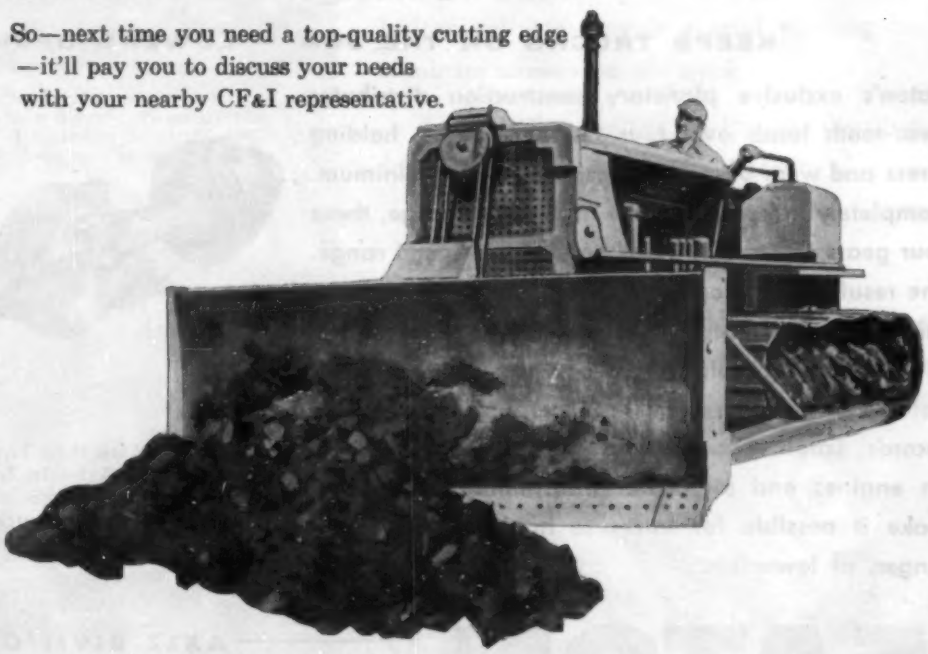

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Road, Street, Highway Builders:

Hydrocranes Earn More Because They Do More . . . Move Faster

The 5-ton ⅜-yd. H-3 Hydrocrane has maximum boom length of 38 ft. (with 3-piece boom). Pictured excavating a catch basin, the H-3 handles dozens of road-building jobs, moves easily from spot to spot.

The Hydrocrane combines unusual flexibility with conventional truck mobility, big capacity, hydraulic power and unequalled precision control to give you a high-speed machine that moves faster, works faster and earns more. With hydraulic power and precision, Hydrocranes lift forms, poles, shoring; handle concrete buckets; load and unload sand, gravel, dirt; excavate for catch basins, water and sewer lines, electric and telephone conduit and manholes.

All-hydraulic design makes possible compactness and lightweight for mounting on an ordinary commercial truck. Four steel outriggers extend and set hydraulically to provide a solid working base . . . eliminate stresses on the truck.

See your Bucyrus-Erie Hydrocrane distributor soon for the complete Hydrocrane story. 178H57C

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The ½-yd. H-5 loads blacktop and dirt on a repair job. Compact design and short tail swing let it work at the curb without blocking traffic. Maximum boom length is 50 feet (with 3-piece boom).

Hydrocrane booms are "live action" booms that telescope out and retract hydraulically, change angle at the touch of a lever to make close quarter work under or over obstructions easier. This H-3 is opening trench for water main construction.

NEW HUSTLE FOR '58... CHEVY LIGHT,

More horsepower... more staying power in V8's and 6's!

New Chevrolet trucks bring you higher efficiency horsepower right up the line, including a revolutionary new V8 development for heavyweights. Here are engines designed to work for you... to save for you... to give you more power than ever before!

If you use light-duty trucks, there's new standard power in every '58 Chevy model . . . a more powerful (145-h.p.!) edition of the engine most famous for economy and dependability, the rugged Thriftmaster 6. And the optional (extra-cost) Trademaster V8 is *all new* and all set to go to work with 160 h.p., 283 cubic inches of displacement, short-stroke efficiency and weight-saving compactness.

Chevrolet for '58 is here with new medium- and heavy-duty power, too! Standard in Series 50 L.C.F. models is a new version of the Heavy-Duty Taskmaster V8, with plenty of power for fleet hauling and new durability features such as Stellite-faced exhaust valves and induction-hardened exhaust valve seats. Series 60 models provide the time-proved Jobmaster 6 with more power than

CHEVROLET **NEW CHEVROLET**

length is 90 feet (with 3-piece boom).

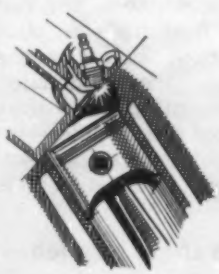
or over obstructions easier. This H-3 is opening trench for water main construction.

MEDIUM, AND HEAVY-DUTY HAULERS

ever—150 h.p.—and a host of new features that mean more economy and dependability on jobs that work a truck hard.

And Series 70 and 80 models come equipped with a big 175-h.p. Heavy-Duty Super Taskmaster V8 newly fitted out with a lineup of advanced, rugged components; this engine is designed to pull mammoth payloads with ease.

But that's not all! Series 90 and 100 models offer a *new kind* of big truck engine, the 230-h.p. Workmaster V8, with radical Wedge-Head design that develops high power and torque at fuel-saving low r.p.m. See your nearby Chevrolet dealer and *save* with Chevy's new brand of hustle! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



RADICAL NEW WEDGE-HEAD DESIGN

In the Workmaster V8, a new kind of combustion chamber gets *extra power* with top economy from regular grade fuel! Cylinder block is machined at 16-degree slant, pistons are of new "peaked" design.

Latest editions of the "Big Wheel" in trucks

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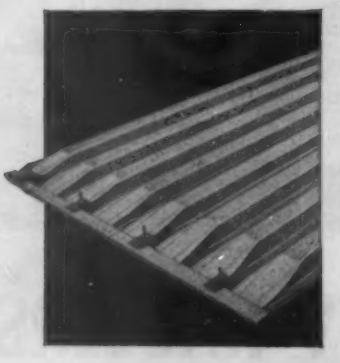

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Headlines

AGC Officials Meet With Chapters on Industry Problems

Top officials of The Associated General Contractors of America will confer on industry problems with many of the association's chapters and branches during their fall and winter meetings. The purpose is to exchange information on conditions in the construction industry and its role in the nation's economy.

Dollar volume records for construction activity are expected to be smashed for the 12th successive year in 1957, with a total of more than $65 billion put in place in the continental United States.

For 1958, the tentative outlook is an increase in dollar volume of about 4 per cent, based on a recovery in residential construction and continuing increases in construction of community facilities such as highways, schools, churches, and sewerage and water systems, more than offsetting anticipated slight declines in commercial and industrial activity.

The total estimate for 1957 is composed of more than $47 billion in new construction and some $18 billion in maintenance and repair operations, compared with $16.1 billion and $17 billion, respectively, for these categories last year.

Despite the record volume of construction being performed today, there has been a rising rate of failures among construction firms, notes an AGC bulletin. The blame is placed in part on increasing competition, the entrance of many new, inexperienced firms into the construction field, and the increasing hazards of doing business in today's economic atmosphere of rising costs and decreasing profits.

AGC officials have long pointed out that competition brings benefits to the public in the form of full value for its investment in construction. The problem of how to survive this competition in the face of a dwindling profit margin is one which faces every contractor, despite the continually increasing volume of construction.

The AGC programs that will be reviewed include: accident prevention, apprentice training, contract forms and specifications, the role of the general contractor in disaster relief, engineering education for

(Continued on page 34)

"Phillips 66 Lubrication Engineers are Johnny-on-the-spot to keep our equipment fully productive"

—Lee McLean, Jr., President
McLean Construction Company
Springfield, Missouri

McLean equipment grading and widening new Commercial Street Trafficway in Springfield.

20,000 yards of earth were moved in grading and preparation of modern, new trafficway.

"WHENEVER WE'VE NEEDED HELP on knotty maintenance problems, Phillips *66* lubrication engineers have been prompt with valuable technical assistance," says Lee McLean, Jr. "We value this help so highly that, for the past three years, we have been an exclusive Phillips *66* customer."

McLean Construction Company specializes in earth moving, highway construction, plant site preparation and municipal work. It operates more than 60 pieces of equipment.

Phillips *66* lubrication engineers can help you with your maintenance problems, too. Phone, write or wire today and we'll have one of our division men on the way. Sales Department, Phillips Petroleum Company, Bartlesville, Okla.

PHILLIPS 66 HEAVY DUTY MOTOR OILS

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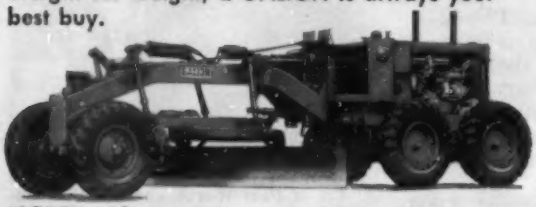
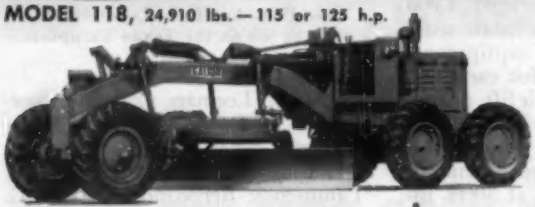
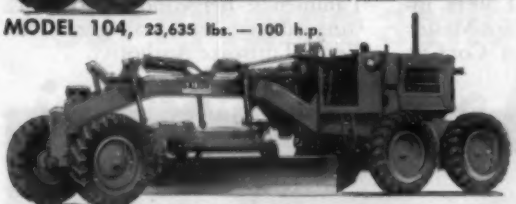


MODEL 118, 24,910 lbs.—115 or 125 h.p.



MODEL 104, 23,635 lbs.—100 h.p.



MODEL 450, 22,415 lbs.—75 h.p.

MODEL 303, 16,165 lbs.—60 h.p.

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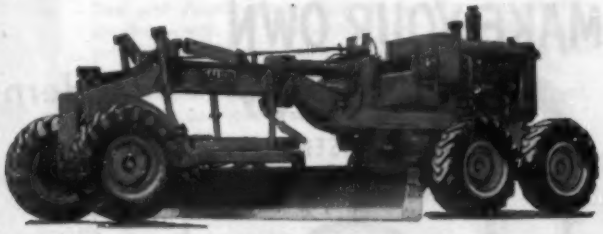
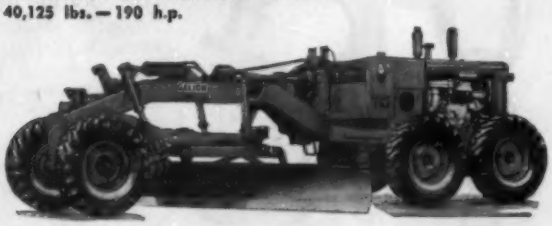
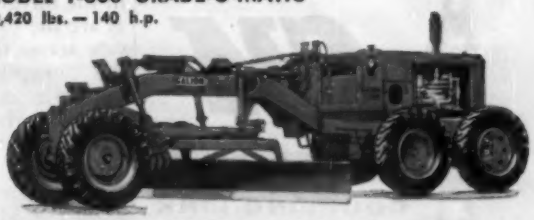


MODEL T-700 GRADE-O-MATIC *
40,125 lbs.—190 h.p.



MODEL T-600 GRADE-O-MATIC *
30,420 lbs.—140 h.p.



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Modern Paving on Texas Turnpike

(Cover Scene)

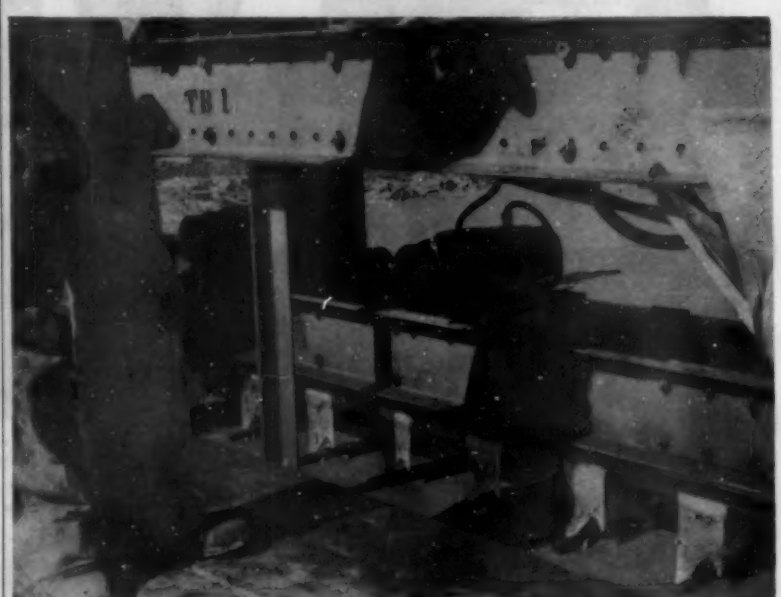
THE TEXAS Turnpike, which was completed during 1957, is the location of the cover scene this month. Here on the new Fort Worth to Dallas connector, Worth Construction Co. is seen winding up a 200,000 sq. yd. concrete paving operation.

As snapped by Don Gehring of the Wire Reinforcement Institute, this picture shows several aspects of modern paving practice. The 52-lb. welded wire fabric mat is in place in the foreground over the first lift, as are the ½ x 36" tie-bars at intervals across the longitudinal joint—the Turnpike engineers' design to minimize cracking and deterioration under heavy traffic.

This contractor averaged 4,000 lin. ft. daily of 25' x 10" slab using a familiar sequence of equipment: Koehring 34E pavers for each lift, Jaeger strike-off for each lift (vibrator on the first machine), and a train of finishing and joint equipment (Flexible, Heltzel, General, Koehring), cross joints at 30 ft. intervals were with a Joint-Master cutter, center joint by a ConCut machine. Leeman Concrete Sawing Co., of Dallas, was sawing contractor.

Consultants: Howard, Needles, Tammen & Bergendoff, Inc. J. C. Dingwall, engineer-manager of the Texas Turnpike Authority.

● Jack Bertram, Worth Construction Co. of Fort Worth, chats with Turnpike inspector L. L. Leyendecker on Worth job on the Texas Turnpike.



● On another Texas Turnpike contract, by Texas Bitulithic Co., Flexible Road Joint machine used to place 1-in. dowels in concrete at 30-ft. spaced transverse joints. Machine eliminates need for joint assembly or cage, pushes dowels through still plastic concrete to a depth approximately 5 in. or mid-depth of slab. The hooks of machine withdraw, leaving the dowels at proper depth and in alingment.

You get depth-controlled, straight-forward precision grading — with the International Drott 4-In-1 *Skid-Shovel* action. Robert N. Orr uses this TD-9 4-In-1 to excavate and load 40, or more, cu. yd. per hour on a Tonawanda, N. Y., street-widening project! Use exclusive pry-over-shoe break-out to dig and load tough stuff!

Only 4-in-1 gives you four grading actions *in one machine!*

Get the grading action you need instantly—by merely moving the machine-selector lever on-the-go! Measure the performance protection of exclusive shock-swallowing Hydro-Spring. See what it means to get 4-machine utility for one-machine price! See your International Drott Distributor for a 4-In-1 demonstration!

Using a back-drag motion of the clam lip, with 4-In-1 *clamshell* action, this operator does a bank-shaping job he could do no other way—except by hand. The exclusive, big-capacity clamshell also gives "stand and fill" action—and self clean-out bottom dumping!

Spreading and leveling fill on Firestone Company property near Buffalo, N. Y.—the operator uses 4-In-1 *bulldozer* action to do fast, close grading. Working depth is regulated by "radius control" of the earth-rolling blade. Contractor: E. R. Granada, Cheektowaga, N. Y.

With inch-close grading accuracy this TD-9 4-In-1 puts new home landscaping on a production-line basis — using *"carry-type scraper"* action. You can also strip and spread with this easy-to-control grading and "earth boiling" ability that "single-action" loaders don't have!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT®

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Headlines

(Continued from page 28)

construction, labor relations, national legislation affecting construction, supply of construction materials, public relations, and relations with other segments.

Advisory Board Appointed for Michigan Highways

A new Michigan highway advisory board, comprising a cross section of talent, has been appointed for the Michigan state highway program according to highway commissioner John C. Mackie.

This board, appointed under a recent state law, comprises J. Carl McMonagle, assistant director, Highway Traffic Center, Michigan State University, and also four Michigan business men—two attorneys, a publisher and an automobile dealer.

The purpose of this board under the law is to provide a combination of highway knowledge, business and professional training, and establish reputations for civic responsibility.

Michigan "Spring Thaw" Law To Be Ended in 1958

Michigan's controversial "frost law," which sharply reduces permissible axle loads during the frost break-up period, may be scuttled as early as next spring. In a surprise announcement to delegates at the Michigan Trucking Association's 24th annual convention, Howard E. Hill, engineering commissioner, Michigan highway department, assured trucking company executives that by next spring a network of roads throughout the state will be established and will allow trucks to carry standard loads the year around.

A new map for truck operators, which is to be issued this winter, will identify special loading routes on which greater maximum loads will be permitted, Hill said.

"Many of Michigan's older roads have sand and gravel bases, which, when properly compacted, can carry any axle load without seasonal restrictions," he said.

He pointed out that only within the past four years have road bases been built thick enough to indicate curtailment of the restrictive frost law. He specified that the highway network on which the frost law will not be invoked will be established after a survey of existing roads.

Overseas Group Formed

A new organization known as "Overseas Americans" has been formed in New York City for membership among construction and engineering workers employed on or interested in overseas projects. It will act as a clearing house for projects in progress or proposed. Herbert U. Ross, president, announces that monthly bulletins will be sent out from the New York headquarters at 7 W. 44th St.

● Additional fencing totalling 411,000 ft. will be erected along the New York State Thruway to protect motorists from wandering livestock. The decision followed a survey in cooperation with the state police. Most of the fencing will be 4-ft. farm fence in rural areas, with a minor amount of 6-ft. chain link fence in certain residential areas. Individual fence sections will range from 528 to nearly 20,000 ft. The projects estimated cost is $339,000.

Permanent ROAD PATCHING Anytime of the year

KEEGAN *Utility* PATCHER

This giant machine now makes it possible to patch pavements quicker, easier and far more economically than previous methods, and with the added advantage that the patching is a permanent job. A heating hood burns out the hole to be patched with 2,000 degrees of heat and makes the existing pavement hot. Simultaneously the machine is making hot asphalt which is spread in the hole and forms a positive bond between the pavement and the patch. The patcher needs only a two-man crew.

The Keegan Patcher cuts patching time better than 60%. Furthermore, patches are permanent regardless of time of year installed. Previously a temporary patch was required in winter, which had to be replaced in spring with a permanent patch. The Keegan giant drying unit makes year around permanent patching possible, since snow, ice or rain do not interfere with work progress.

Send for illustrated folder and Complete Details

Keegan Utility Patcher
Dept. H
3830 Monroe Avenue
Pittsford, New York

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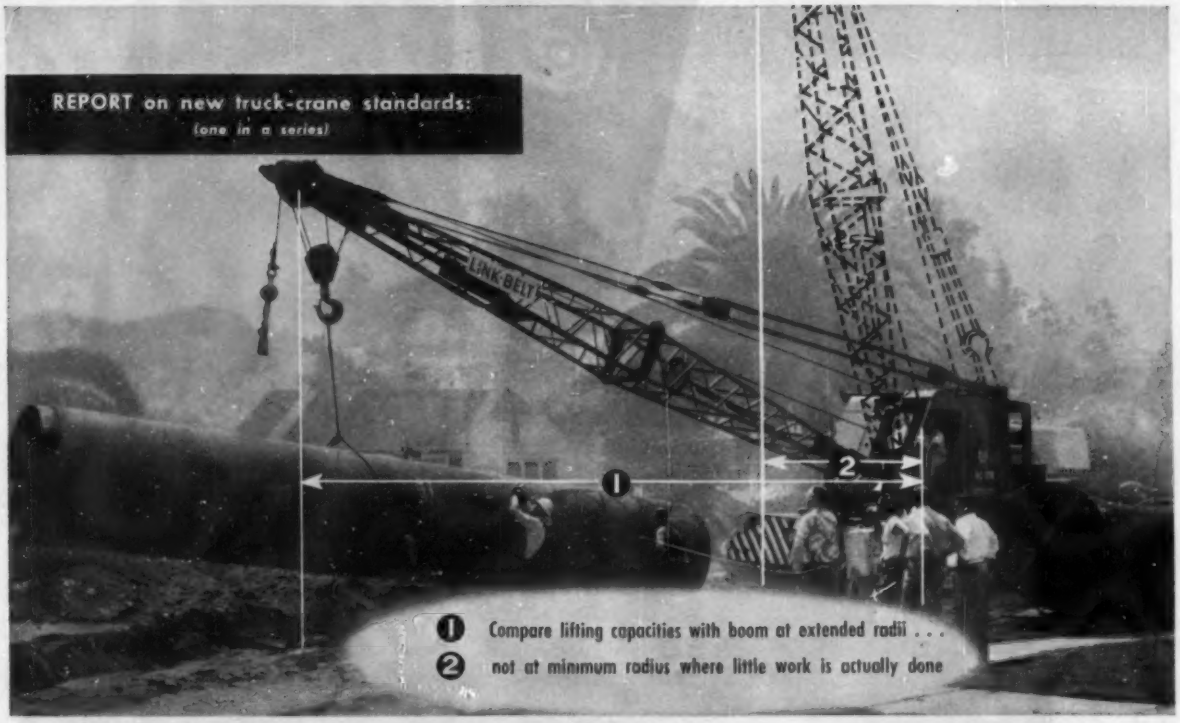

REPORT on new truck-crane standards:
(one in a series)
LINK-BELT
1
2
1 Compare lifting capacities with boom at extended radii . . .
2 not at minimum radius where little work is actually done

TRUCK-CRANE PRODUCTION: Most truck-crane jobs require using long booms at extended radii. Under these circumstances, Link-Belt Speeder machines are unsurpassed. Why? Because of high strength-alloy booms and new high-capacity jibs, extra "live" weight, strategically located uppers for better balance and stability plus advanced-design features such as clutch *up* and *down* on boomhoist.

Extending truck-crane utility

With new increased lifting capacity at extended radii plus outstanding mobility, Link-Belt Speeder Zephyr-cranes handle many jobs formerly handled by crawlers

Truck-crane production is directly related to lifting capacity. But lifting capacity varies with boom length and radius.

Thus, it's important to measure capacity on the basis of a boom out 25 feet and beyond where the bulk of the work is done. You'll be amazed to find that a Link-Belt Speeder far outperforms other similarly rated machines.

It's one of many ways a Link-Belt Speeder helps set new, more profitable standards of truck-crane operation. Contact your Link-Belt Speeder distributor or write for details. LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS, IOWA.

FAST, POSITIVE, SAFE CONTROL —True power hydraulic controls are a Link-Belt Speeder exclusive . . . utilize oil under pressure to do the work. The operator merely flips short-throw levers. Smooth-operating hydraulic-actuated clutches provide perfect feel of the load at all times.

LOAD LOWERING CLUTCHES —Hydraulic-actuated reversing clutches are available for either or both main drums. They provide power load lowering of main hoist line and jib whip line. All clutches are interchangeable within a given machine . . . are self-adjusting for heat and normal lining wear.

14,530

It's time to compare . . . with

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive 3speed-o-Matic power hydraulic controls

. . . for more details circle 270 on enclosed return postal card

INTERNATIONAL six-wheelers cover the range from 22,000 lbs. GVW to 76,000 lbs. GCW in conventional and COE design. There is one practically custom-built for every hauling job in the world's most complete truck line. Widest choice of load-moving and load-carrying components to keep operating and maintenance cost lowest.

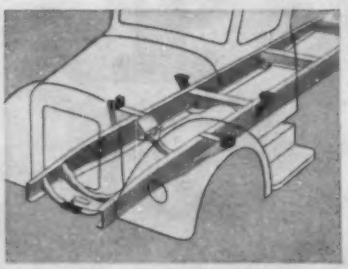
Here's a unique double-duty vehicle—the new INTERNATIONAL Travelette! Seats six big people comfortably in two full-width seats! Hauls up to a full ton load in all-steel 6-ft. pickup body. Service-utility body and four-wheel-drive models available.

INTERNATIONAL TRUCKS

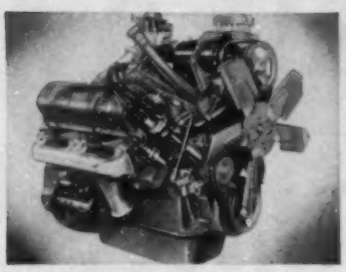
Longer Tandem Life

Just one reason why contractors find International Trucks cost least to own!

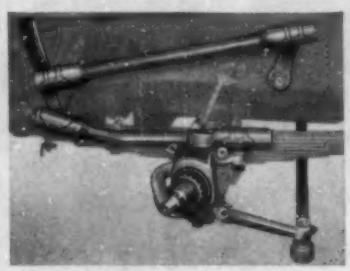
Pull through rugged off-highway terrain. Sturdy, long lasting tandem has extra flotation, positive traction always.



Cabs last longer even in the most severe operations with exclusive 5-point mountings. Quieter, easier riding.



Save time, save money with the most powerful V-8's you can get—to 257 hp. Other power plants up to 356 hp.



Easy to handle even in tightest spots with true geometric steering, cam and roller-mounted steering gears.

Plenty of strength for toughest jobs, biggest loads with frames that have extra rigidity and proper flexibility.

End service costs and maintenance with rubber mounted, sealed and shielded "silent spin" center bearings.

Tough off-highway construction jobs require tandems and all other parts that are built to stand up and take it . . . that will keep operation and maintenance costs 'way down.

And that's the way INTERNATIONALS are built. Cost records prove* this all-important fact—INTERNATIONAL Trucks cost *least* to own.

This superiority doesn't just happen. It's the result of INTERNATIONAL'S rigid policy to build trucks that will do the job better, do it longer and at least cost.

Why not follow the lead of men who know truck costs to the penny, men who have made INTERNATIONAL six-wheelers the sales leader for the past 22 straight years. Make your next truck an INTERNATIONAL.

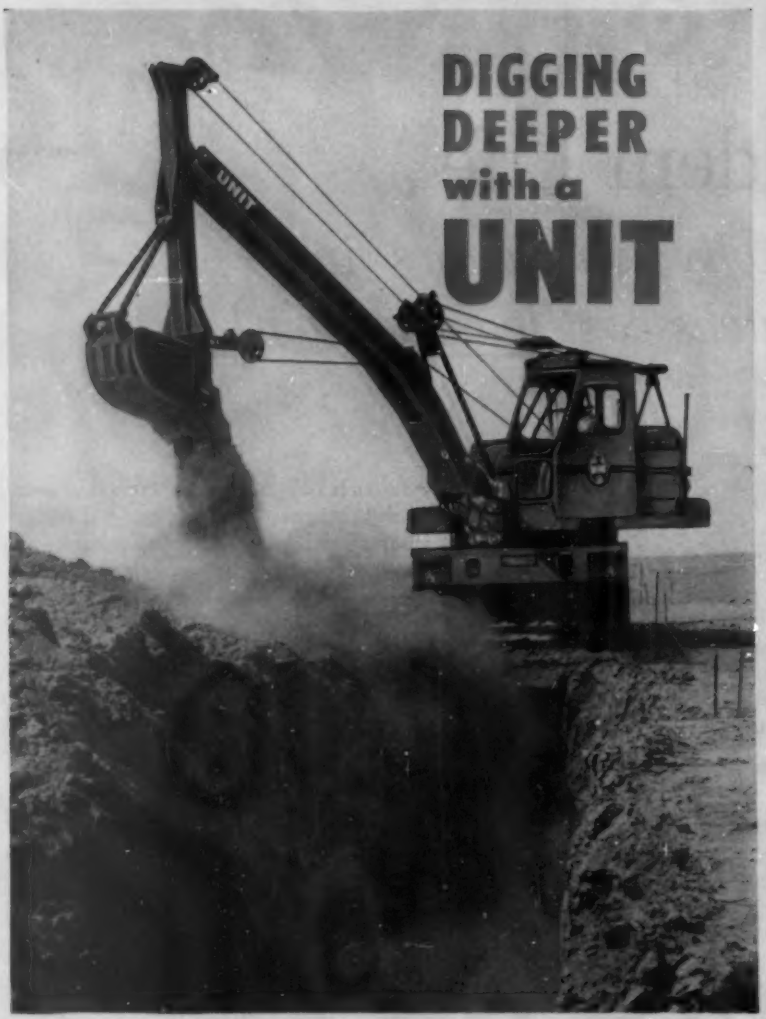
**Signed statements in our files from fleet operators throughout the U.S., back up this statement.*

cost least to own!

. . . for more details circle 266 on enclosed return postal card

INTERNATIONAL HARVESTER COMPANY, CHICAGO

Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors



You'll Dig More Jobs At More Profit With A UNIT TRENCHOE!

Accurate deep digging of trenches for pipelines, sewers, water connections, footings, basements and culverts is easily and quickly accomplished with a UNIT Trenchoe. The "Goose-neck" boom with its long deep reach assures maximum production. Also saves time trimming vertical sidewalls and corners, and in leveling floor surfaces. Powerful... Compact... Perfectly Balanced. Every UNIT is designed to meet the most rigid demands. Investigate today and earn more pay.

UNIT models are available in ½ or ¾ yard Excavators . . . Cranes up to 20 tons capacity . . . Crawler or Mobile types . . . Gasoline or Diesel. Ask for literature.

UNIT CRANE & SHOVEL CORPORATION
6407 W. Burnham St. • Milwaukee 14, Wis., U. S. A.

Geared to Produce Maximum Yardage

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Personals

Mrs. Morrison, Wife of M-K Leader, Dies at 72

Mrs. Harry W. Morrison, wife of one of the heads of Morrison-Knudson Co., Inc., recently died at the age of 72 in Boise, Idaho, of a cerebral hemorrhage. Daughter of a gold miner, she was born in Centerville, an old mining town of southwestern Idaho, Boise basin, April 26, 1885. She married Mr. Morrison two years after he joined with Morris H. Knudsen in establishing the Morrison-Knudsen firm.

Mrs. Harry W. Morrison

Mrs. Morrison had traveled widely with her husband in the supervision of the company's operations, which in 1956 reportedly did $409 million worth of construction. In 1953, she was honored by Pepperdine College with an honorary doctor of laws degree as America's "first lady of construction."

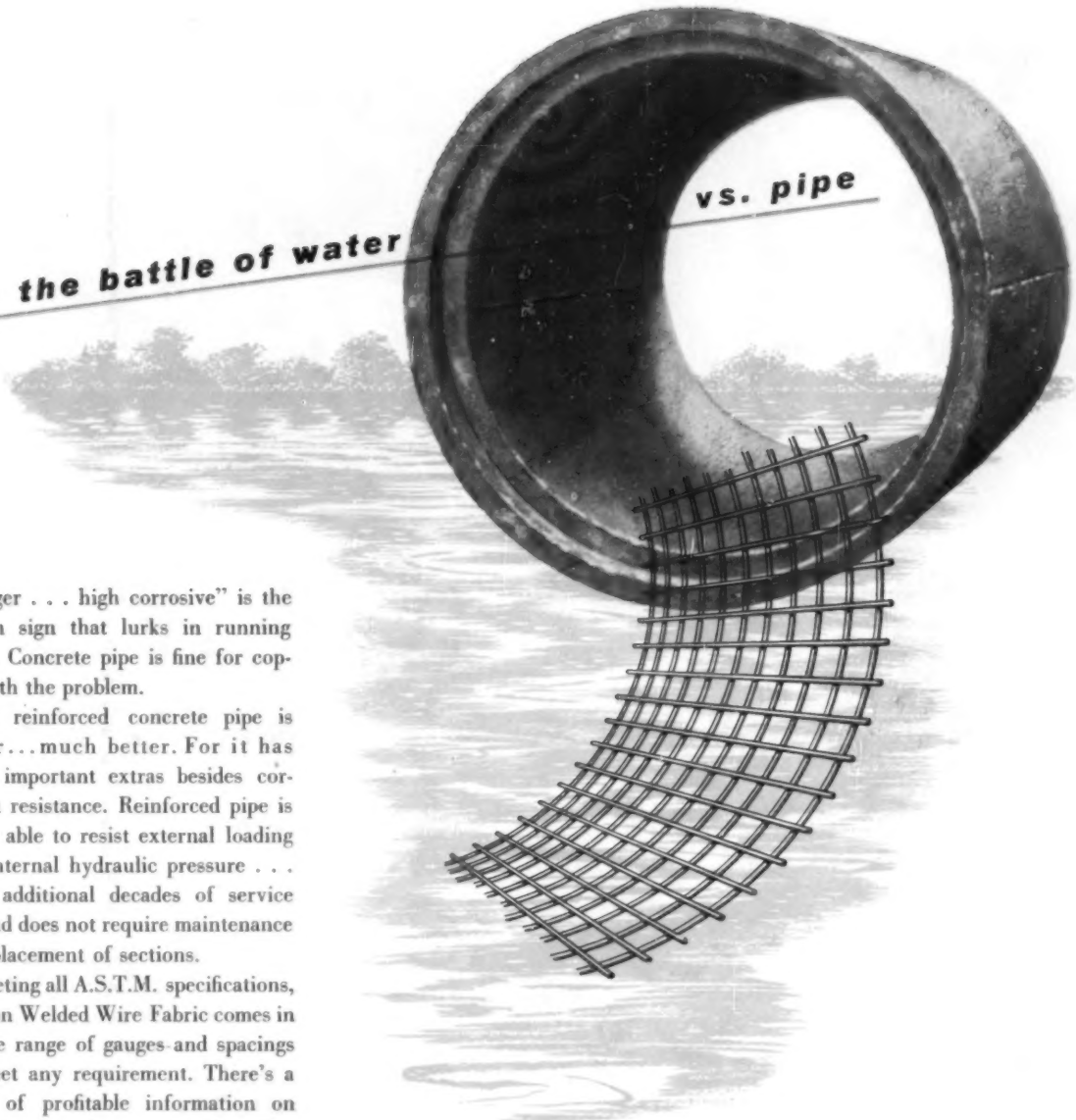
WILLIAM L. COOPER has been named to the staff of the National Bituminous Concrete Association, Washington, D. C. He will handle public relations activities in addition to his duties as administrative assistant to executive director H. K. Griffith. Previously Cooper was employed as executive secretary of the Washington (D. C.) Association of Plumbing Contractors.

HUNTER IRVING, formerly state construction engineer, has been made assistant chief engineer of the North Carolina state highway commission.

Earl Crump, for many years a division engineer with the commis-

CLINTON WELDED WIRE FABRIC

for the battle of water vs. pipe



"Danger . . . high corrosive" is the hidden sign that lurks in running water. Concrete pipe is fine for coping with the problem.

But reinforced concrete pipe is better... much better. For it has other important extras besides corrosion resistance. Reinforced pipe is better able to resist external loading and internal hydraulic pressure . . . gives additional decades of service . . . and does not require maintenance or replacement of sections.

Meeting all A.S.T.M. specifications, Clinton Welded Wire Fabric comes in a wide range of gauges and spacings to meet any requirement. There's a mine of profitable information on the subject at the nearest sales office listed on the other side of this page. Call soon.

WHEN THEY ASK...

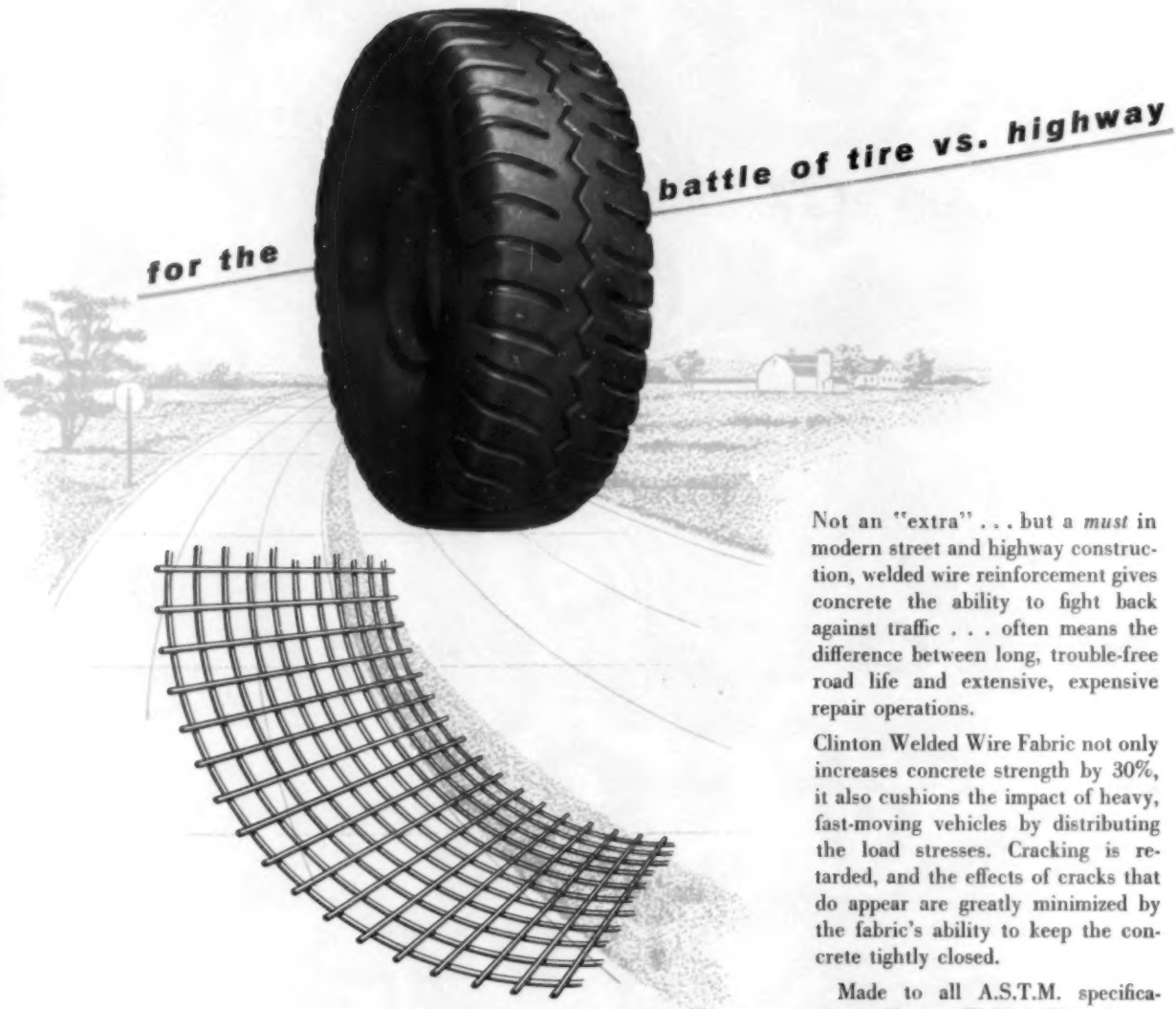
"is it Reinforced"

SAY YES...WITH CLINTON WELDED WIRE FABRIC

THE COLORADO FUEL AND IRON CORPORATION: DENVER • OAKLAND • NEW YORK

CF&I

CLINTON WELDED WIRE FABRIC



Not an "extra" . . . but a *must* in modern street and highway construction, welded wire reinforcement gives concrete the ability to fight back against traffic . . . often means the difference between long, trouble-free road life and extensive, expensive repair operations.

Clinton Welded Wire Fabric not only increases concrete strength by 30%, it also cushions the impact of heavy, fast-moving vehicles by distributing the load stresses. Cracking is retarded, and the effects of cracks that do appear are greatly minimized by the fabric's ability to keep the concrete tightly closed.

Made to all A.S.T.M. specifications, Clinton Welded Wire Fabric comes in a wide range of gauges and spacings. For full information, contact our nearest sales office.

WHEN THEY ASK...
"is it Reinforced"
SAY YES...WITH

CLINTON
WELDED WIRE FABRIC
THE COLORADO FUEL AND IRON CORPORATION

CF&I

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Casper • Denver • El Paso • Ft. Worth • Houston Kansas City • Lincoln (Neb.) • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle Spokane • Wichita • **WICKWIRE SPENCER STEEL DIVISION**—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia
CF&I OFFICES IN CANADA: Montreal • Toronto • **CANADIAN REPRESENTATIVES AT:** Calgary • Edmonton • Vancouver • Winnipeg

Portable A-W plant producing base material for large state highway job near Los Banos, California.

AUSTIN-WESTERN Crushing Plant produces rock at low cost for Richards-Underdown Co., Fresno, Cal.

High output and low cost—that's the story on the Austin-Western 101-S Crushing Plant working for one of the biggest producers in the San Joaquin Valley. Despite its large capacity, it can be moved easily and fast from job to job.

In the operation shown above, feed material is scalped ahead of the crushing plant to remove fines and produce minus 1¼ inch material. Feed over the scalper goes to the primary crusher, which has a 1036 jaw. It then passes into the big 30 x 20 inch roll crusher, which turns out a ¾ inch plant-mix material. The plant has three conveyors, which deliver sand and road-base material in sizes of 1 inch and minus ¾ inch.

The plant is powered by a 62.5 kva generator, driven by a diesel engine. The individual motors operate the conveyors and the scalping screen through short-coupled V-belts—there are no idlers, clutches, etc., to cause mechanical loss. The crushing plant itself is direct-diesel-driven by a propeller shaft. A single convenient push button station controls the entire closed-circuit system.

There's a high-speed, profit-making Austin-Western Plant exactly right for your needs. Call on your nearest distributor for full information. Or write Construction Equipment Division, Baldwin-Lima-Hamilton Corp., Lima, Ohio.

COMPARE—AND YOU'LL WANT AN AUSTIN-WESTERN CRUSHING PLANT

1. *Welded steel plate frame for high strength without weight of cast steel frame.*
2. *Machined steel toggle plate for absolute protection, instead of cast iron.*
3. *Inclined positive-throw-type vibrating screen.*
4. *All moving screen parts operate in rubber bushings that need no lubrication.*
5. *Dual rear wheels for added stability; fully enclosed brakes on rear tandem.*
6. *Oversize self-aligning spherical bearings in crusher.*
7. *Heat treated chrome vanadium steel shaft in crusher.*

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

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AUSTIN-WESTERN
CRUSHING, SCREENING AND WASHING EQUIPMENT

BALDWIN BLH LIMA HAMILTON

BALDWIN-LIMA-HAMILTON
Construction Equipment Division—LIMA WORKS

OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation
Hamilton • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works

NEW! THE CAT* NO. 7G BULLDOZER

Blade tilts 3′ to either side!

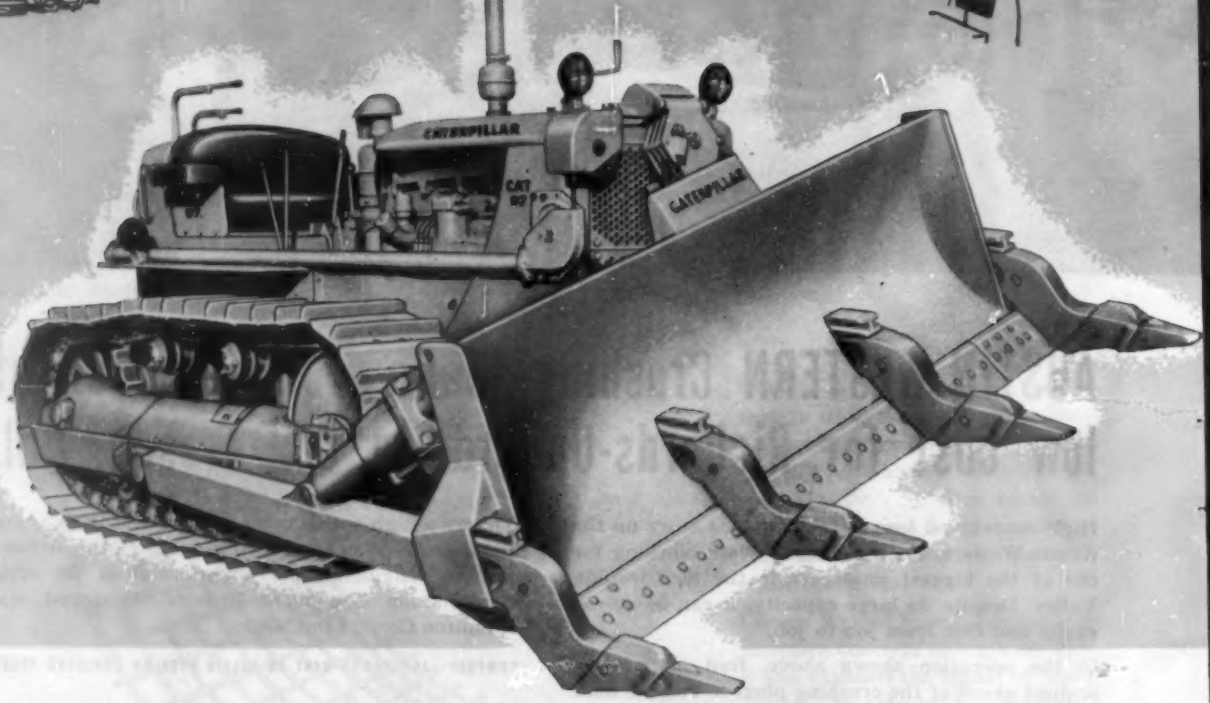
Teeth slice through hard materials!

Blade tips through a 16½° arc!

Teeth easily removed!

Teeth pick up and carry!

Handles easily!



'DOZER AND RIPPER IN ONE

The brand-new Caterpillar No. 7G Bulldozer is a completely different type of bulldozer. The amazing tilt-tip action, and its four heat-treated cast steel teeth, are an entirely new concept in 'dozing. The Gyrodozer is both a 'dozer and a ripper.

YOU'LL GET HIGHER PRODUCTION

The Gyrodozer rips through hard or frozen materials. Its 23″ teeth not only pry out boulders but pick 'em up and carry 'em away. In rocky soil, the wedging action of the teeth surfaces small rocks for scooping up by the 10′ 10″ blade. On the really tough jobs, the tractor's full horsepower can be put behind a single tooth. The Gyrodozer is ideal for uprooting trees and clearing an area in a hurry.

. . . for more details circle 247 on enclosed return postal card

EASY TO OPERATE

A Cat No. 25 Cable Control raises and lowers the 'dozer and a front-mounted No. 44 double-valve Hydraulic Control tips and tilts the blade. The operator never needs to leave his seat to make a blade adjustment.

GET FULL DETAILS

on the revolutionary new Gyrodozer from your Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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WANTED—
THE HARD WORK

INDIANAPOLIS RUNWAY HAS FIRST

Banked High Speed Plane Turn-Off

Completion of paving in 1957 autumn was made possible, despite rainy summer, by use of Possolith to secure workable "high early" mix, permitting equipment on adjacent lanes in three days. Wire mesh reinforcement and experimental lighting are among the design features.

By D. R. Parsons
Clyde E. Williams & Associates, Indianapolis, Indiana

BANKED HIGH-SPEED turn-outs, flush centerline lights and varied thicknesses in cross-section of concrete runways are features of a new runway in the Indianapolis airport. These innovations are part of a field extension by the Indianapolis Board of Aviation Commissioners in cooperation with the Civil Aeronautics Administration, in anticipation of jet plane traffic. The city-owned field is officially known as Weir Cook Municipal Airport.

The new paving includes a 7,300 ft. x 150 ft. runway with connecting taxiways, high-speed turn-outs and warm-up apron, a total of 180,000 sq. yd. of concrete. The concrete slab is 12 in. thick in a 750-ft. section, full width at each end of the runway. Turn-outs, taxiways and warm-up apron are also 12 in. thick. The four middle lanes of the runway are 10 in. thick and the two outside lanes are 8-in. concrete.

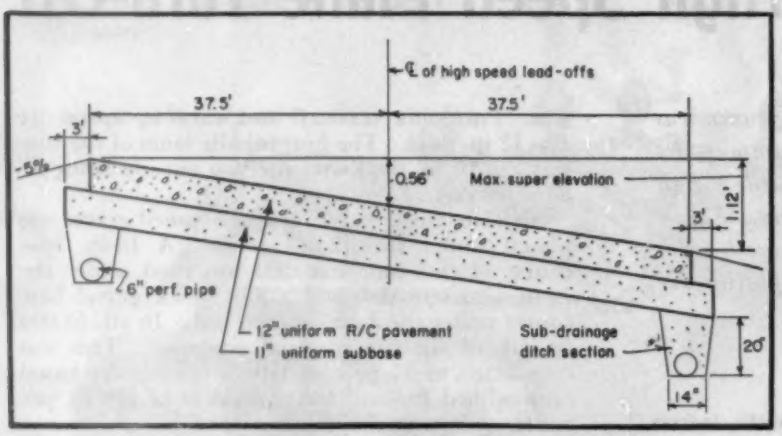
An 11-in thick base course of crushed gravel was placed under the 12-in. section. A 10-in. base course of the same material was used under the 10-in. concrete slab and a 8-in. thick gravel base course under the 8-in. concrete slab. In all, 55,000 cu. yd. of subbase material was used. This was compacted to 95 percent laboratory density based on modified Proctor, the equivalent of 139 lb. per cu. ft.

Wire mesh reinforcement in weights from 74 lb. to 86 lb. per 100 sq. ft. was used throughout the project.

The three high-speed turn-outs following a 955-ft. centerline radius were designed by A. W. Compton, vice president of Clyde E. Williams & Associates, engineers of Indianapolis, Ind. The turn-outs are built to allow planes to clear the main runway at speeds up to 63 mph. Mr. Compton points out that the high-speed turn-off should be termed "super-depressed" rather than "super-elevated," the edge of the inner radius being 12 in. lower than the outside edge. This design, he explains, gradually tilts the plane into a banking position as it crosses the centerline of the runway and begins wheeling into the curve.

• Finishing machine at work on 25-ft. lane of 250-ft. warm-up apron. Burlap drag and bridge for finishers are shown in center of picture.

● Newly placed concrete being hand vibrated. Jaeger spreader is striking off first lift. At left truckload of reinforcing mesh being distributed.



● Cross-section (see X-X in accompanying plan sketch, page 46) through high-speed turnout at point of maximum super elevation.

The general contract for the improvements was awarded to the Gast Construction Co., Warsaw, Ind., in August, 1956, at a bid price of $1,553,335. Harry Weese was superintendent for the Gast company. Grading was sublet to E. E. Schnitzius Co., Indianapolis.

Work on the grading and drainage began October 1, 1956. This required approximately 25,000 lin. ft. of corrugated bituminous-coated metal pipe, in 6-in. to 54-in. diameters. Much of this was metal arch pipe. The system included 23 concrete catch basins and 17,000 ft. of 6-in. perforated subsurface drain pipe. This was placed under the new runway 55 ft. from the centerline on each side.

A fill 2,700 ft. long, approximately 1,200 ft. wide and 12 ft. at the deepest section, was required at the southwest end of the new runway. Fill material totaling 350,000 cu. yd. was removed from the northeast end of the runway where a cut was required.

Serious difficulty was encountered on a 3,000-ft. section of the runway when a perched water table with artesian pressures was uncovered. Before the subgrade at this point could be consolidated sufficiently to support equipment for fine grading and shaping of subgrade cross-section, it was necessary to install drain pipe 4 ft. below the subgrade elevation. In one area the soil was in such a plastic state that equipment was practically buried. This was due to impervious clay soil which retarded percolation. More than two weeks work was required for installation of French drains in a herringbone pattern 4 ft. below the subgrade, and extensive backfilling with porous material. This permitted the excess water to be drained away through the airport's main drainage system.

Equipment used on the grading and drainage work included seven Allis-Chalmers model 300 motor scrapers, four Allis-Chalmers HD-20 tractors, a 50-ton compactor, sheepsfoot, and tandem sheepsfoot units. Ralph Humphrey was superintendent for the grading.

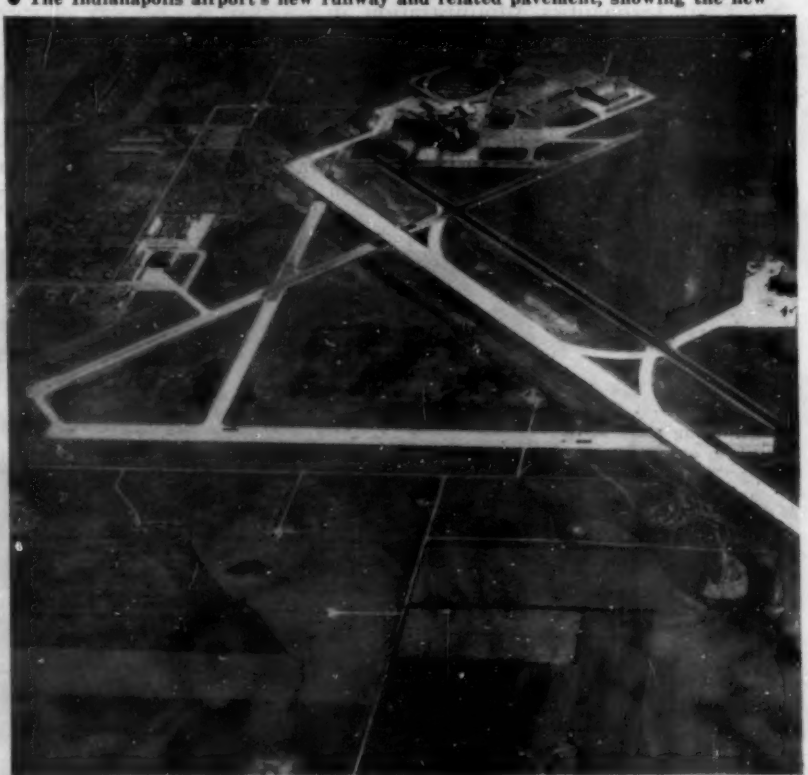
The extremely wet weather from early spring until August delayed the grading so that paving could not be started until August,

Concrete Design

Job specifications called for Class B concrete with a minimum of 5.5 bags of cement to produce from three-point loading, 700-lb. modulus of Rupture.

Mix Design—1 Cu. Yd.
5.5 bags cement Type I
5 Gal. H0 per bag
3.5% air
Fine agg. 30%
Coarse agg. 40-60 basis
¼ lb. Pozzolith Retarder per bag

● The Indianapolis airport's new runway and related pavement, showing the new



The most significant feature of this mix was the use of the Pozzolith retarder which permits the reduction of the water, resulting in a good workable mix at 1½-in. slump.

This low water cement ratio produced a hard surface that permitted the contractor to put his spreaders and finishing machines on the slab after three days curing, without any damage to the concrete.

The short runs of form lines on the bypass, turn-outs, and runway would have caused delays for curing had it not been for the hard surface that "high early" mix produced.

The choice of this mix was based on the consultants' previous experience with the design and due to the late start (August 19). Every possible consideration was given in order to finish before cold weather.

The low-slump concrete layed in place on the super-depressed turnouts, without movement to the low side as generally occurs from the working of the finishing screeds.

Three sets of beams were made for each full day's run. These were cured in an insulated room in water heated to 72° F. with a Silent Glow hot air heater thermostatically controlled. The 101 sets of beams broken in the field laboratory averaged 746 lb. M.R.

The concrete surface was tested with an impact hammer before the contractor was permitted to put his equipment on the slab. These tests showed 3,200 lb. psi at three days, 4,400 at four days, 5,000 at six days. The use of this type of hammer has been correlated with cylinder breaks and beam break, and is being written in specifications by other designers as a means of control on structural concrete, eliminating the expense of making, curing and breaking cylinders.

● **Field laboratory and beam curing house. The author and one of the concrete technicians are examining a specimen from a pile of broken test beams.**

● **D. Randolph Parsons, project supervisor; Jack Arthur, chief of security ground control forces at airport; Donald E. Tharp, acting superintendent of airport are shown above.**

design of turn-offs.

One pound of Possolith per gallon was mixed in two 500-gal. tanks connected with a switch valve. An electric motored agitator kept the solution well mixed. This was pumped through a dispensing meter and fed into the sand as it came into the weighing hopper. This equipment was furnished to the contractor by Master Builders, manufacturer of the retarding agent.

Longitudinal sawing and sealing was completed after a 7-day curing period. The slabs then were used as haul roads for batch trucks and earth movers.

Tests on mix design were run by H. C. Nutting Co., Cincinnati, Ohio.

TEST BEAM

Results of three sets with Pozzolith

7-Day Break	28-Day Break
613	740
627	732
514	740
633	791
553	698
596	741
594	757
533	723
635	791

Nutting had to go to 6.5 bags without Pozzolith to get the required strength. This does not imply that Pozzolith takes the place of cement, but indicated that it did facilitate the reduction of water which gives the higher strengths obtained.

Transverse joints spaced 75 ft. apart, were sawed within 8 or 10 hours after the concrete was placed, using diamond blades and

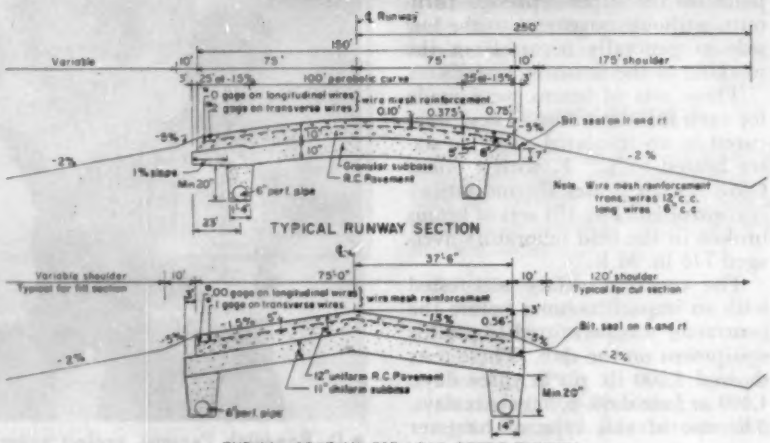
● **(Left): Test beams immersed in tank in controlled-temperature room on the project. (Right): Part of the testing facilities for concrete quality control, set up for this job.**

a bridge machine designed and built by Concrete Contracting Services of Racine, Wis. Mortar wash-out from pressure of coolant water was very slight.

Johnson batching equipment included two cement bins with bucket elevators. Two Koehring clamshell cranes handled aggregate. The concrete was placed in 7 and 5 in. lifts by pavers with strike-off of the first lift, placement of reinforcement, and top lift spread and finished with standard equipment.

Longitudinal joints were sawed down the center of each 25 ft. lane excepting in the end areas where the slab is 12 in. thick. One-inch round dowel bars 16 in. long were installed in all joints on 12-in. centers.

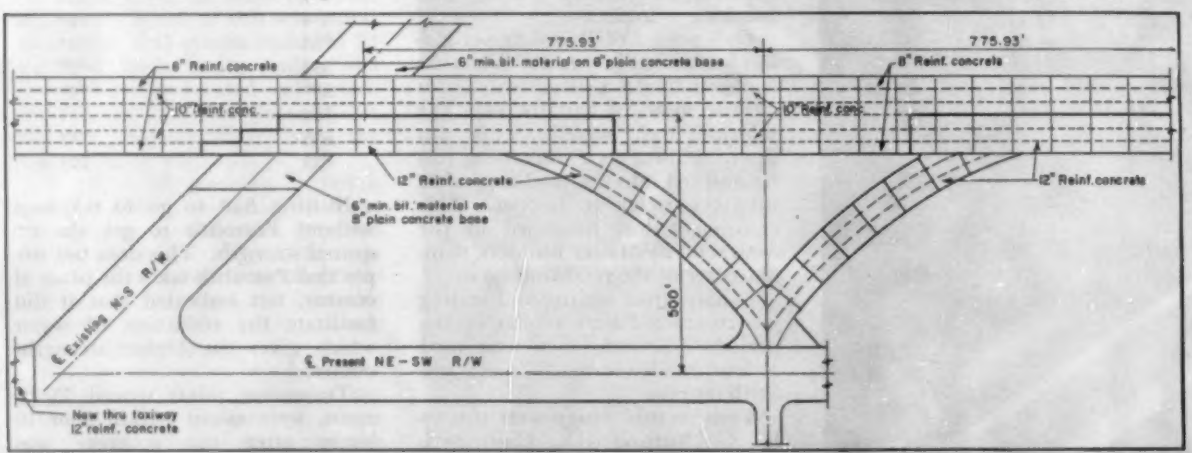
The decision to reduce the slab thickness of the two outside lanes to 8 in. was based on findings of a survey conducted by Clyde E. Williams and Associates in cooperation with the CAA. This revealed that 85 percent of all landings used only the four center lanes at any time.



● **(Top): Cross-sections (not to scale) of runway and taxiway. (Bottom): Special design of turn-off from runway to taxiway showing tilting of slab.**

Among the difficulties encountered in constructing the new facilities was the necessity of crossing

(Continued on page 48)



● **Plan view of turnout scheme, showing some of the geometrics and also the jointing and other structural elements.**

The No. 12's part in a good team job

The Caterpillar No. 12 Motor Grader is a key piece of equipment in efficient earthmoving. By leveling fill and building and maintaining haul roads, the No. 12 helps tractor-scraper rigs handle bigger loads in faster time.

The job pictured is at Fogelsville, Pa., where W. E. Johnson had a 231,000-yard contract, relocating nearly a mile of U. S. 22. Smooth haul roads maintained by the Cat* No. 12 Motor Grader allowed three Cat DW21s pulling No. 470 Scrapers to move 4,000-6,000 yards of dirt per day.

In Mr. Johnson's words: "We're Caterpillar people. We've had a lot of experience with Cat equipment and we know when we start a job we can count on finishing it with a minimum of down time."

Construction men everywhere regard the No. 12 Motor Grader as the standard in its field. It is ruggedly built for heavy, round-the-clock work. And its balanced design and dependable four-cycle Cat Engine make it a big producer. Operators like the fast, positive controls, easy blade positioning and unobstructed visibility from the seat. Most tire down time is eliminated by tubeless tires. The exclusive oil clutch operates for many hundreds of hours without adjustment. And in-cab starting, electric or gasoline, is standard.

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Ask your Caterpillar Dealer for an on-the-job demonstration. He protects the long work life of the machines he sells with reliable parts and service.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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Please send me immediately ..... copies of "The Road Ahead."

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"Super-Depressed" Turn-Outs Were No Special Problem

The 75-ft. wide turn-outs, designed for high-speed plane movement off the new main runway at Indianapolis, is about 8 in. higher at the outside edge than at the inside at a point midway around the turn.

Contractors will be interested in the fact that regular 10-ft. form sections were used in chord fashion for the turn, which has a centerline radius of 1,012 ft. Also that the screed settings used in constructing the six 25-ft. lanes of the parabolically crowned runway were used for the lanes along the turn-outs. The finishing machines had the usual adjustability of contour, needed to meet specification surface tolerances.

The problem of slumping or sluffing of the concrete during construction was also reported to be "no problem." A rigid control of all quality factors, including that of a relatively low slump, was maintained throughout the runway project, and this paid off in finishing the turns.

The fine points of surface warping design of this turn-out are also worthy of note. According to the Clyde Williams & Associates staff, the first consideration was to maintain an unbroken parabolic surface on the new runway, from end to end, for high-speed plane operation. The outer radius of the high-speed turn-out was carried around the turn on level grade. The inner edge was warped downward from the runway junction, so as to project the slight downward grade experienced by the pilot as he veers from the crowned runway centerline toward the lower runway edge and onto the turn. Precise form setting was the key. This super-depression, rather than super-elevation, also simplified surface drainage problems.

INDIANAPOLIS RUNWAY

(Continued from page 45)

Among the difficulties encountered in constructing the new facilities was the necessity of crossing three of the existing runways with construction equipment in the face of 95 scheduled flights daily plus movements of private planes. The work was completed without a single accident due to a careful plan worked out by Jack Arthur, chief of the airport's safety forces. The plan included close cooperation between the control tower, radio cars and specially trained flagmen directing the movement of trucks and other construction equipment. The existing northeast-southwest runway, parallel with and only 500 ft. away from the new runway, continued to handle the bulk of the air traffic including the largest four-engine planes during all stages of construction.

Field testing of soils, aggregates, cement and all materials used on the project was done by two technicians furnished by H. C. Nutting Co., of Cincinnati. A laboratory equipped to conduct all ASTM tests was set up by the contractor at the field.

Quality control of the concrete was the responsibility of the consultants, under the author's direction.

The experimental flush centerline lights are installed in one of the high-speed turn-outs near the northeast end of the new runway. The installation consists of 12 white lights countersunk at 100 ft. intervals along the centerline of the new northeast-southwest runway plus a line of blue flush lights in the centerline of the turn-off. There is also a flashing blue light countersunk 500 ft. ahead of the turn-off to warn the pilots of the turn-out.

Lighting Units

The light units being tested at Indianapolis consist of cylindrical sheet metal casings, about 13 in. in diameter and 18 in. deep. Each unit has its own transformer, a 250-watt lamp, a color filter if required, and a metal covering and prism arrangement. The prism, which is recessed into the metal cover, emits a 20,000 candlepower signal beam about 15 deg. wide and directed at a vertical angle of two degrees. The two degree height of beam is calculated to be visible to the pilot at an average cockpit height of 20 ft., 600 ft. down the runway. The 15 deg. lateral dispersion will permit the pilot to see the blue line of turn-off lights as he approaches them from the side.

Depending upon weather conditions, the brightness of the centerline lights can be adjusted by voltage regulators. The series circuit, high voltage line feeds the units through 2-in. cable-ducts from a cable at the edge of the runway.

Centerline Painting

CAA is considering painting white and blue centerlines to help the pilots use the turn-offs in daylight hours. The entire centerline flush light project stemmed from an industry-airline meeting in Washington in August when the need for such experimentation was expressed. Centerline lighting already has been used in Europe. It is expected that some form of survey will be developed to test pilots for their reaction to, and acceptance of centerline lighting.

The experimental installation was under the supervision of Raymond C. Herner, chief of the CAA Airport Division at Indianapolis. Runway and taxiway lighting of the conventional type installed at other parts of the new construction consist of 18 in. lighting units along the ground at the edges of the runways. Contract for the lighting was awarded to the Harris-McBurney Co., Jackson, Mich. at $72,000.

Lighting Federally Financed

The runway and turn-off construction was financed on a matching funds basis under the Federal Aid to Airports Program, the city of Indianapolis and the Civil Aeronautics Administration contributing equal amounts. The CAA also paid the entire cost of the experimental lighting on the turn-outs, and paid 75 percent of the cost of new lighting on the new runway.

Fred W. Sommer, is president of the Indianapolis Board of Aviation Commissioners.

New ARBA Movie on Right-of-way: "Terrific"

A MOTION PICTURE has just been produced which could easily become our best single salesman in getting urban and bypass highways located.

We refer to the picture, "You Take the High Road," created under the direction of Gen. Prentiss, executive vice president of American Road Builders, with help from the Construction Industry Manufacturers Association and some fifteen other associations and manufacturers.

This color motion picture dramatizes the problems of ordinary folks in communities where a new expressway is about to be blazed through back yards, or where a new bypass is planned. The characters in the picture are real, and representative of the citizens who are giving right-of-way agents a hard time everywhere today.

"The most 'uncorny' picture of its kind yet produced," a metropolitan highway leader exclaimed on previewing the film. The editors of *Roads and Streets* agree that it is indeed terrific. It will surely soften up many of your human road blocks, because the viewer will inevitably identify himself with one or another of the characters who come alive in the film and who, in the end, see things the engineer's way.

The job now is to get this picture shown everywhere. It will be available for showing at nominal cost to women's clubs, chambers of commerce, property owner groups and others.

The Illinois Road Builders' Association has ordered four copies in color and one in black-and-white. One will be released through the Illinois division of highways, one through Cook County (which is snarled up with the multi-million dollar Congress Street Expressway over right of way), one to the Illinois Chamber of Commerce, one for its own use, plus the black-and-white copy for releasing through TV stations.

Lest anyone forget, location and right-of-way are the No. 1 problems in most states in getting the Interstate highway program into high gear. Nearly a billion dollars will go for land alone this year, and more next year.

If you, as a contractor or contractor-association representative or whatever your background, think you can help put this picture to good use, please write to Maj. Gen. Louis W. Prentiss, American Road Builders' Association, World Center Building, Washington, D.C., and get the details.

This film is "the best." It doesn't bore. It doesn't "sell." It just helps people see the light.

Constructive Thoughts on Right-of-Way Acquisition

A good many states currently are realizing far too little progress in the Interstate road program due to a lack of the proper legal tools and administrative set-up for acquiring land. Where the state highway department does not yet have the laws and court decisions it needs, this matter is worthy of a special session of the legislature. The federal-aid billions are piling up! And the public is waiting for the new roads.

Speed of land acquisition, however, must not be obtained at a sacrifice of the democratic principles. In this connection, the Knickerbocker Press of Albany, N. Y., recently published an interesting editorial. Hearkening back to several years ago when the gigantic Thruway was being built in the Albany area, this editorial pointed out that many property owners were incensed over the delay due to red tape in getting their land taken and paid for.

"Sometimes delay resulted because an owner wanted to haggle over terms," said this editorial, "yet even those who settled quickly found that this didn't mean they would get the money very fast. One explanation was that the state insisted on tracing titles clear back and, in the meanwhile, no payment could be made."

This editorial said that during the Thruway program the state departments of Public Works, Laws, and Audit and Control often blamed each other for the delay. Today, in contrast, all of these agencies find it convenient to blame the Bureau of Public Roads.

This editorial continued, "Our feeling is that except in those cases where property owners look on the state as a way to unload a white elephant profitably, persons whose land is needed should be paid a fair minimum quickly. Other details should be ironed out later. We still think this is the right way even though the state may pay $5,000 to the wrong person and have trouble getting it back."

Speaking in a more philosophical vein, the editorial added, "As for the federal government's insistence on public hearings being a delaying feature, well, democracy is likely to be delaying, but we still like it... We think, too, after the hearings are all over, the state Public Works department should build a road where it wants to in terms of serving the majority of the users and in terms of keeping costs within bounds."

MR. CONTRACTOR

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TUNNEL EXCAVATING

LOADING HEAVY ROCK

Illustrated are just three job conditions where 105 Eimco Excavators outperform other earthmovers. It takes care of the tough jobs just as efficiently as it does the easy ones.

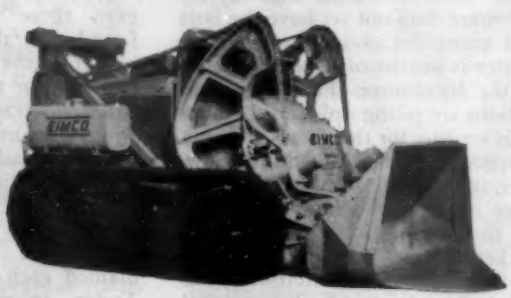
The knowledge and experience gained from building thousands of underground loaders was used to full advantage when we designed and engineered the Eimco Excavator. We gave it the same extra strength for severe service; increased the life and efficiency of working parts thru simplification; gave it I.T.R. (independent track reversal) mobility and "passenger car" power-shift operating ease. Then we put the operator up front where he can see what's going on.

Overhead discharge speeds cycle time; makes it possible to dig, load and dump from one position and do road-work without stopping highway traffic.

With powerful crowding action (39,000 lbs.) the Eimco 105 loads large rocks without secondary blasting usually required when boom shovels or other loaders are on the job.

The Eimco 105 Front-End Loader combines this same high tractor mobility with front end loading versatility for handling scores of different jobs economically.

Write for information on the Eimco 105 Tractor Excavator or Front-End Loader . . ideal highway building tools.



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The simple test reveals many things about a vehicle's engine, and individual cards give a permanent record. The Indicator Fluid is covered by Patent No. 2,770,530.

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"Greater oil economy . . . reduced maintenance costs . . . thanks to the SHELL ADC Oilprint Analysis."

THE OHIO TURNPIKE operates 225 maintenance and patrol vehicles over its new highway to assure *maximum road safety*. The Shell ADC* Oilprint Analysis was recently adopted so that the oil in every vehicle in the fleet can be constantly checked.

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Let a Shell Representative demonstrate the simple application of this program. You'll see for yourself why cost-conscious fleet operators are proving the Shell ADC Oilprint Analysis a valuable preventive maintenance tool. *Trademark

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We Relocated a River and Shot Away a Mountain, to

BEFORE Cut section transposed upon the photo to show the tremendous block of solid rock taken out to make way for the new road.

BOOM! "Fire in the hole!" First shot of the huge cut blasts a beginning

By Pat Thomson **County Engineer, Douglas County, Waterville, Washington**

Unique strategy provided ample rock borrow for this job and permitted economic channel change during period of relatively low water.

OUR GROUP was standing in a huddle, doing the usual toe kicking in the dirt, discussing the aspects of the Cashmere-Stevens Pass highway. Ed Sloan of the Washington state highway department is the typical western resident engineer. Lean, taciturn, Ed is used to handling the meaner than average problems on rugged western construction projects. Therefore, I was surprised when Ed suddenly blurted out, "This is one of the toughest grading jobs I have ever seen. O'Neal was either working in the river or in solid rock."

How would you handle the moving of an entire river to make room for a 4-lane highway? The Wenatchee is no sluggish, grassbound stream. It often becomes a churning, turbulent flow fed by melting Cascade mountain snow. Leaving this, how would you buck into a 229-ft. cut where 450,000 cu. yd. of solid rock excavation was squeezed between a mountain and a city.

These were the problems of the C. E. O'Neal Construction Company of Yakima, Wash. The project was awarded to O'Neal in April, 1956, on a low bid of $542,066. This Cashmere re-alignment is an expanded link in the 4-lane highway connecting north-central and eastern Washington with the Seattle area.

From the beginning station, it meant moving the entire Wenatchee River south a minimum of 150 ft. to allow room for 4-lane construction along the northern bank. A channel was excavated along the southern bank, and all material shoved northward. This formed a dike, crowding the river against the north bank and allowing dry excavation of the remaining material.

In Washington, where salmon fishing is a major industry, all major streams are under direct jurisdiction of the Department of Fisheries. Any tampering with stream flow is under strict regulation to protect the salmon industry. Specifically, earth-moving operations had to be planned to prevent constructing the channel and thus causing swifter-than-normal flow or muddying beyond spring run-off effect. All in all, though, the fisheries department cooperated highly.

Excavating the southern half of the channel meant relocating and reconstructing approximately one mile of dike to protect the city of Cashmere

Grade a 4-Lane Highway

of the end for this rocky pinnacle. Average shots were about 5 tons.

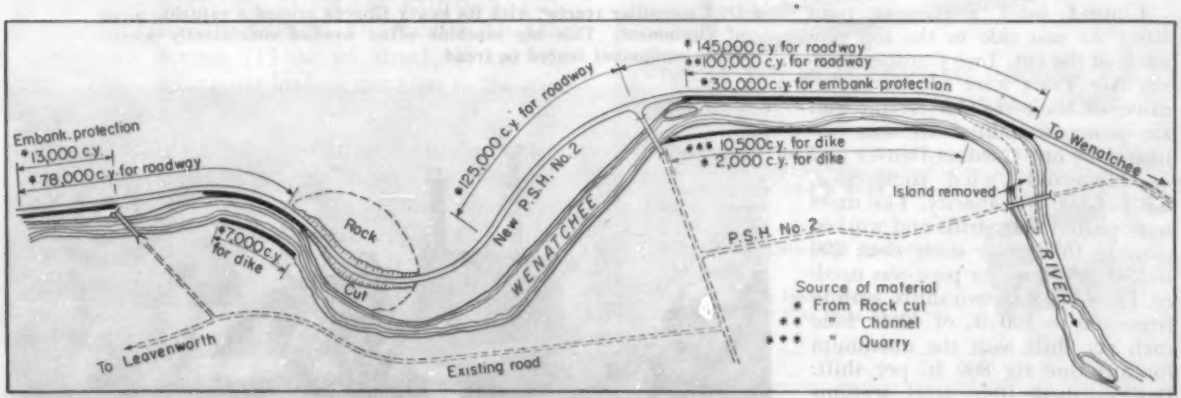
AFTER Shot material was moved out with the Northwest shovel loading into Euclids.

from the river's spring rampaging. This in itself involved removing and replacing 1,500 ft. of 4-in. municipal water line. The river was then turned into the excavated south channel and the north material pushed further north into the highway fill area.

The channel change brought the river directly toward an island it previously flowed around. In the interests of existing bridge protection and free channel flow, the entire island was excavated and removed for fill material.

The squeeze between river and mountain wasn't enough. Added to the headaches was a Chelan county road that had to be preserved, maintained, and protected at all times. In one instance, this necessitated the placement of 240 ft. of concrete retaining wall. At the western end of the project, this road doubled as a frontage road. So that portion was torn up, rebuilt, ballasted and surfaced under O'Neal's state contract, much to the pleasure of the county.

Leaving the river, the road line ran head-on into a 229-ft. solid rock cliff (see photo). This problem was tackled earnestly by Frank Consect, grade foreman. Frank came to work for Tip O'Neal "just for the hell of it." That was 21 years ago, and every-time he gets restless O'Neal cracks, "Whatsa matter —ain't my money good?"



Plan of project showing relocation problem and job features.

● Northwest shovel excavating the keying trench for the riprap along the south side of the road fill.

● Heavy riprap from the big cut was placed on the river side of the road for a width of 15 ft. Euclid dumps ton-sized boulders over the fill area.

with 3¼-in. tungsten carbide tipped bits, and drilling on a 10 x 10 ft. grid. Bits cost about $60 each, and luckily could be sharpened in a shop only eight miles away. Bits were sharpened on an average of ten times.

The rock was an unusual sandstone-basalt combination with hard cross slants of igneous faults that were encountered on each drilling. The sandstone did not stick the drills, but were soft, requiring special care and slower drilling. The sandstone beds were particularly abrasive, eating the bit edges rapidly.

Blow and Let 'er Go

Two things prevented a "blow and let 'er go" policy. First, all of the rock was needed for fill or riprap. Secondly, rock could not be shot into the river due to both the salmon run problem and the danger of constricting flow and forcing water into the lowlands and endangering a portion of Cashmere. Consequently, shooting was done from the river side in toward the centerline (see sketch), half the roadway width per shot, in sections about 150 ft. long. The south side of the centerline was shot out for the length of the cut, before switching over to the north side. This, in effect, gave a controlled breakage and throw inward from the river, using a millisecond fusing with the long delay on the outside.

Foreman Consect explained that he likes DuPont No. 5 because it was fast acting, gave good fragmentation and a quick breaking lift. Holes were not sprung. Each 40 ft. hole was loaded direct with 2½ boxes of explosive to about 10 ft. from the top, using one box of 3¼-in. stick in the bottom and 1½ boxes of free flowing powder for the

(Continued on page 57)

Consect built a pioneer road from the east side to the top pinnacle of the cut. Two Gardner-Denver Air Tracs were moved in because of their crawler mount and air power mobility. Air was furnished by one Gardner-Denver and one Ingersoll-Rand compressor, both of 600 cfs capacity. The units were paired with drills and worked close so that never more than 200 to 250 ft. of hose or pipe was needed. The drills ran two shifts, getting from 400 to 500 ft. of 40 ft. hole each per shift with the maximum for any one rig 800 ft. per shift. Drillers used 10-ft. steel sections

● D9 Caterpillar tractor with its heavy rippers proved a valuable piece of equipment. This big machine often worked consistently where other equipment feared to tread.

JOB REPORT FROM GOLDSBORO, N. C.

on the new CAT* DW15 (Series E)-No. 428 LOWBOWL Scraper

Whenever a new machine is introduced, this question comes up: "What'll it do on a job?" Reports from actual jobs in different sections of the country show there's a definite answer for you on the new Caterpillar DW15 (Series E)-No. 428 LOWBOWL Scraper. Compared with competitive units of similar capacity, this new earthmover heads the pack with high production.

Here are facts and figures from a contract on U. S. Highway 117 near Goldsboro, N. C. The contract, handled by S. T. Wooten Construction Co., Stantonsbury, involved moving about 3,000,000 cu. yd. of material in a section 2.3 miles long. The material was coarse, moist sand (70%) and clay (30%). Hauling loads of 14.1 bank cu. yd., the DW15 (Series E) unit averaged 7.02 round trips an hour on a 3,600-foot cycle. Details are shown in the box to the right.

From every angle, the new DW15 is designed for high production at low cost per yard. Its Caterpillar Engine packs 200 HP (maximum output capacity). With speeds up to 37.2 MPH plus the stability of four wheels, it delivers fast round-trip hauls with greater safety than two-wheel rigs. Its new wide-section 26.5 x 25 tires provide maximum flotation. And the new No. 428 LOWBOWL Scraper (13 cu. yd. struck, 18 cu. yd. heaped), provides a faster loading rate clear to the end of the loading cycle.

For comparative cost-of-operation figures on other actual jobs, see your Caterpillar Dealer. He's a source of reliable information. Ask him to show you *proof* that the new DW15 (Series E)-No. 428 can pay off for you! Name the date—he'll demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

JOB DATA ON DW15 (SERIES E)-NO. 428*

Material: Coarse moist sand (70%) and clay (30%)	
Round-trip distance	**3,600′**
Average load time (min.)	**1.06**
Average haul time	**3.28**
Average turn and dump time	**.61**
Average return time	**3.61**
Average cycle time (incl. delays)	**8.56**
Average trips per hour	**7.02**
Bank cu. yd. per trip	**14.1**
Average hourly production (bank cu. yd.)	**99**

**The unit was push-loaded by a D8*

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Peoria, Ill.

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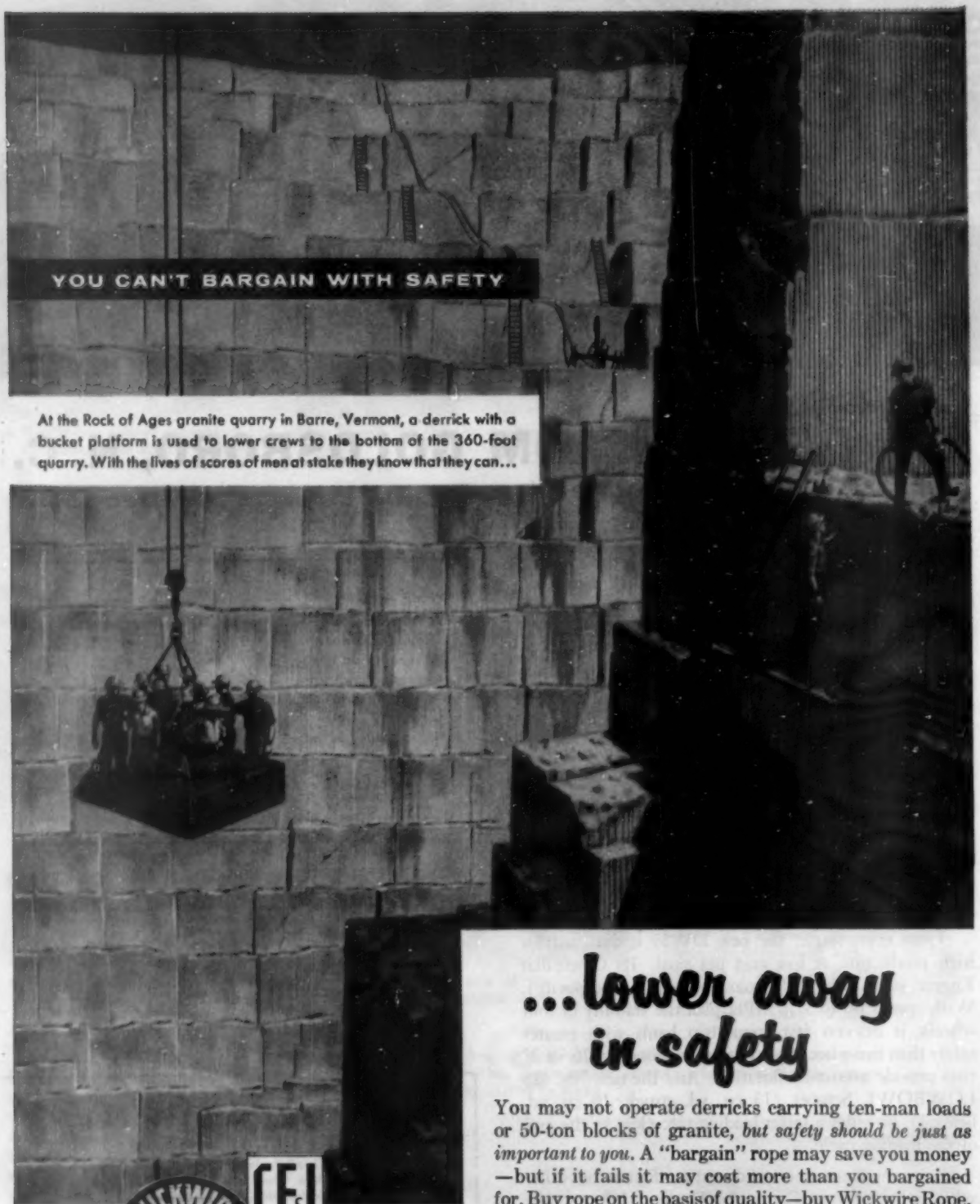

At the Rock of Ages granite quarry in Barre, Vermont, a derrick with a bucket platform is used to lower crews to the bottom of the 360-foot quarry. With the lives of scores of men at stake they know that they can...

...lower away in safety

You may not operate derricks carrying ten-man loads or 50-ton blocks of granite, *but safety should be just as important to you.* A "bargain" rope may save you money—but if it fails it may cost more than you bargained for. Buy rope on the basis of quality—buy Wickwire Rope.

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CF&I

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
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● The Air-Tracs drilling in the hard basalt cross slants.

SHOT AWAY A MOUNTAIN

(Continued from page 54)

rest of the hole. On the basalt sections, a 40% Gel was used. The biggest shot was 8 tons. The average use was 5 tons per week. Explosives were freighted in and stored in a portable metal storage house.

The shot muck was moved out in two 18-yd. and six 12-yd. Euclid end-dumps loaded by a Northwest 80D 2½-yd. shovel. The remaining yardage in the job was dozed into place using a D9 Caterpillar, whose size and weight made it efficient to handle the large yardage in and around the channel changing operation in this manner. This unit was equipped with a heavy ripper, with two teeth, which greatly expedited the job. The larger material was used along the south side of the road fill, bordering the river. This riprap was placed 15 ft. wide for over 4,000 ft. Riprap was keyed in for good anchorage by trenching to depths up to 5 ft.

This project was about 95% complete by May 1, 1957, and right on time schedule. Mr. Jarvis, head of Cashmere's public utilities, spoke from the standpoint of the outside observer more than a little interested in its progress. He felt O'Neal had proceeded with all due dispatch and that the state highway department had cooperated fully with outside agencies. The city was particularly concerned with certain channel changes. And another line in Washington's expanded highway program is almost ready for the traveler.

● Several corrugated metal culverts being tamped into place using both the mechanical tamper and the D9 for compaction.

● Tractors and pans making the pioneer road and scalping the 220-ft. cut, preparatory to first drilling (looking from the east side).

Contractor Short Wave Radio Use Threatened by FCC

The Federal Communications Commission would like to abolish the special industrial radio service which has a high priority group of frequencies available to a selected number of business firms. This is a service used extensively by many contractors and other firms in our membership. The FCC wants to replace this band of frequencies with a so-called business radio service with power restricted to 180 watts. At the same time the number of licenses would be greatly increased.

The proposal to let down the license bars and to limit power used is bringing a considerable number of objections from the construction group, according to a note from the Virginia Road Builders Association to its contractor members.

Carquinez Bridge Spotlights

High Strength Steel and Submerged Arc Welding

A FOUR-SPAN CANTILEVER truss bridge, presently being built across the Carquinez Strait in California, marks a milestone in the advancement of welded bridge designs. Nearly 30 million lbs. of steel, all shop welded, will be used in the superstructure of the four lane highway bridge. This includes nearly 6 million lbs. of USS "T-1" constructional alloy steel in the most highly stressed members and 11 million lbs. of USS "Tri-Ten" high strength, low alloy steel in other crucial members. Much of the welding is done with semi-automatic submerged arc welders using standard procedures and 70,000 psi tensile electrode. American Bridge Division of U. S. Steel, is fabricating and erecting the job.

Extensive use of the high strength steel effected cost savings estimated by the California Highway Department at $800,000. This results from the substantial weight reduction which was made possible. The 45,000 psi stress allowed for the "T-1" is 2½ times that permitted for ASTM A-7 steels and nearly twice that of ASTM A-242 steels. Approximately 15 percent of the steel in the bridge is "T-1".

Welded design simplified members to three basic sections: H-sections for tension members, box-sections for members with normal compression, and internally supported box-sections for members with heavy compression.

● **Welder deposits ⅜ in. fillet welds at speeds in excess of 12 in. per min.; runs 12-15 ft. before stopping to refill flux cone.**

American Bridge uses three types of submerged arc equipment for welding: full automatic, and both mechanized and manual semi-automatic. Though some welds on the heavier box-sections require as many as 38 passes to complete, ⅜ in. fillets make up a large part of the work. Several Manual Lincoln-weld units are used on these welds.

The State of California approved all submerged arc procedures for the Carquinez Bridge before construction began. The ½ percent molybdenum, 70,000 psi tensile, electrode used on the "T-1" provides ample strength for the stresses at the joints where it is used, even though it does not match the high strength of the steel. This judicious use of material produced considerable savings over the cost of depositing a higher strength weld.

L. C. Hollister, project engineer on this bridge for the California State Highway Department, will present a paper on the project at the national meeting of the American Welding Society in St. Louis in April, 1958.

● **The Carquinez Straits bridge which will link the San Francisco Bay area with Sacramento Valley marks a milestone in bridge design.**

Wage-Hour Records on Interstate Road Projects

The Virginia Road Builders Association has done its members a service in calling attention emphatically to the requirements in reporting hours and wages on Interstate highway projects. The Wage-Hour division of the U. S. Department of Labor, in its annual report, noted that some 16,000 firms were found to be in violation of the wage-hour laws. The violators were found to owe employees about $10 million in overtime pay. Several heavy fines were reported by the division, noted the Virginia bulletin, which were imposed because of willful violations or irregularities in handling back payments, including kickbacks from employees.

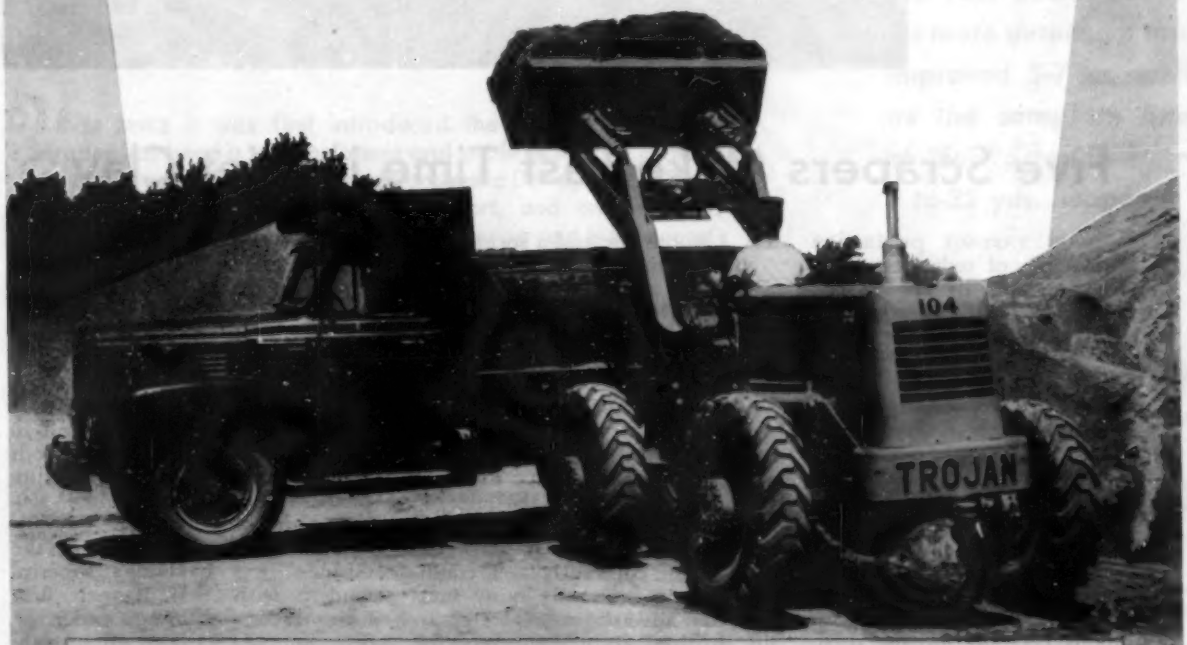
One Pennsylvania construction firm, this report went on to note, was reported as owing its employees $26,000 in back pay. The violation was caused by the fact the firm's offices did not know it came under the Act.

There are few, if any firms, in highway construction which are not covered by the law noted the Association's bulletin. The federal courts have ruled almost every class of work "in interstate commerce." The importance of records and documented files cannot be overemphasized so far as payroll data are concerned. A complete record of hours worked, wages paid and proper documentation shows when an employee's pay records do not conform to the law. These are your best defense against long and time-consuming investigations as well as fines for willful violations.

How a YALE & TOWNE Tradition Benefits TROJAN Owners . . .

With the famous YALE trade-mark appearing on the new line of TROJAN tractor shovels, owners are finding that Yale & Towne's 90 year tradition of only the best in engineering, materials and manufacturing can pay-off in operating benefits . . . Today, every TROJAN, regardless of size, is designed and built to *dig, carry* and *load* better than any comparable machine on the market — and here's how they do it . . .

TROJAN'S straight line horizontal thrust utilizes the total weight and power of the machine for maximum *digging* efficiency; the low load carrying position permits fast, stable and safe travel; the high-lift reverse curve safety arms carry material to maximum *loading* height with exceptional speed and complete personal safety for the operator . . . Compare — you'll find that only TROJAN has *all* the operating features that mean extra dollars in profits to you!



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TRACTOR SHOVELS

2 & 4 Wheel Drive Front-End Loaders

CONTRACTORS MACHINERY DIV., THE YALE & TOWNE MANUFACTURING COMPANY, BATAVIA, NEW YORK, SAN LEANDRO, CALIFORNIA

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● Disc 'n roll! International D-24 crawler tractor with dozer towing a sheepsfoot roller and a disc on Illinois toll road job. The discs worked overtime to break up heavy clay clods.

● Borrow area along side 30-ft fill, shown nearly topped out with Euclid scrapers on clean-up.

Five Scrapers Make Fast Time in Wet Clay

THE HIGH YARDAGE production possibilities of today's scrapers was demonstrated by one of the subcontractors on the Illinois Toll Road this past summer. The firm is Lakeside Construction Co., Inc., of Chicago and Denver. This company was a subcontractor under Ralph Myers Contracting Corp., who in turn subcontracted the 5,300,000 cu. yd, of earthmoving on Section T-12 of the toll road. (Myers' own phenomenal summer's run is reviewed in the October Issue of *Roads and Streets.*)

Lakeside's part of the T-12 grading consisted of building a continuous clay fill for the dual roadway, 30 ft. average height and 210 ft. average base width by 2,800 ft. long. Together with ramps this came to about 700,000 cu. yd. The blue and brown clay came from borrow pits immediately adjacent.

The Lakeside firm began moving dirt at 6 p.m. on July 8, 1957, using 5 Euclid S-18 scrapers, 3 International TD-24 tractors, 1 Cat D9 and 1 D7 tractor, 2 Cat 12 motor graders, 2 Gebhart sheepsfoot rollers, 1 Rome disc and a sprinkler.

By running two 10-hour shifts, 120 hours a week, the 700,000 cu. yd. was virtually all cleaned up by September 8 despite 15 working days lost on account of rain or wet soil. This figures 8,970 cu. yd. per shift for 78 shifts. Or something over 3,600 cu. yd. per 2-shift day per scraper, to figure it another way. The haul distance averaged only about 400 ft. for the job.

Lakeside officials feel justly proud of this showing, considering the heavy soil, constantly wet conditions in an unusually rainy summer, and adverse grade from pit to fill involved throughout most of the work.

The good yardage is credited to a constant study of the job to minimize haul length, and to the use of heavy push tractors. The D9 and one of the TD-24's were used for pusher service, without dozer blades. Leaving off the blades not only made the tractors more agile and effective as pushers, according to one spokesman, but also helped avoid damaging tires. No accidental tire cuts occurred on the entire job—a detail that represented a large difference in the possible profit margin for the company.

As with other Illinois Toll Road contractors, light plants were an important adjunct here to the two-shift operation. Lakeside used three Master generators (5 and 10 kw) with 1,000-watt reflector floods on 20-ft. towers. These were supplemented by pipe-mounted 150-watt reflector floods.

R. R. Hicks, a veteran in the business, was Lakeside's superintendent, with C. M. Bennett, firm member, also on the job under the direction of Stanford B. Smith, company president.

Toll Road Paint Striping

The cost of paint and labor for the striping of pavements on the 160-mile Indiana toll road during 1957 was $42,611, as done by the commission's maintenance forces.

This compares to contract performance of the same operation in 1956 at the low bid of $80,654, according to the commission.

NOW TORQMATIC DRIVE boosts S-7 performance

See your Euclid dealer for more details on this improved S-7 as well as the complete line of "Euc" Scrapers from 9 to 32 yds. heaped.

EVER SINCE it was first introduced the Model S-7 Euclid Scraper has been a top performer and profit maker for owners. Now it's available with 4-speed Torqmatic Drive, a new Torsilastic seat for greater operator comfort, and an improved hydraulic system that provides easier steering and is independent of other scraper operations.

With these new improvements the S-7 is a more productive machine than ever—here are some of the reasons why:

- **Faster loading** because the 4-speed Torqmatic matches engine power to job requirements—provides greater power in the loading ranges to get heaped loads of 9 yds. in a hurry.
- **Faster cycle time** because changes from one speed range to another are made under full power with no loss of momentum—operator can maintain higher average travel speed.
- **Lower costs** because Torqmatic has cushioning effect on entire power train—reduces downtime and maintenance expense.
- **Easier operation** because new Torsilastic seat absorbs road shocks, thus reducing driver fatigue—improved hydraulic system results in easier smoother steering—elimination of manual shifting makes good operators out of mediocre ones.

. . . for more details circle 300 on enclosed return postal card

MORE VERSATILITY at minimum investment . . . a 10-ton rear-dump body is interchangeable with scraper bowl for work where rock and heavy excavation must be moved and where close quarter loading and dumping conditions prevail.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

A *NEW** Kind of Bottom Dump!

NEW ATHEY-CAT PW20-DW20

New design features for faster, lower cost material handling.

- **"T-1" Steel Construction** — PW20 40-ton payload capacity is nearly 4 times trailer weight. No excess weight, lower operating costs, less maintenance.
- **High Clearance Rear Design** — Up to 5 ft. rear clearance speeds up dumping cycles, prevents tie-ups at the dump.
- **3-Door Dumping** — Load empties through wide bottom doors and rear door. Material dumps instantly, or can be windrowed under positive hydraulic-actuated control.
- **Low Loading Height** — An average height of only 8' 9½" cuts down shovel loading time, gives you more yards per hour, more loads per day.
- **Powered by Cat DW20** — World-proved Cat DW20 Tractor powers this new team. High speeds, low maintenance, maneuverability — are a few of the DW20's many features.
- **Steep Side Slope** — 18° side plate angles help speed dumping, give less "funneling" action to material.

. . . for more details circle 237 on enclosed return postal card

The latest in the earthmoving field! It's the new Athey PW20 Bottom Dump Trailer and it's loaded with new design features. Constructed of high-strength "T-1" steel, the PW20 is trimmed of excess weight, capable of handling 40-ton payloads at less cost. The capacity of the PW20 is nearly 4 times the trailer weight.

An exclusive high arch axle and 3-door design eliminate resistance of the dumped material. The load is dumped through three doors: two extra wide bottom doors and a rear door. The unit rolls easily away from the dumped load, without tire spinning, cutting time from your dumping cycles.

Combined with the Cat DW20 Tractor, the new PW20 offers you unequalled material handling performance — big-capacity payloads, high-speed hauling, easy loading, instantaneous dumping, high production and low maintenance.

There are many more reasons for putting the PW20 to work. Get the story from your Athey-Cat dealer, or write for new PW20 booklet. Athey Products Corporation, 5631 West 65th Street, Chicago 38, Illinois.

Athey

THE *Complete* TRAILER LINE... *by the Leader*

● Machine designed and built by Ashbak Construction Co. for joint renovation.

● Applying hard-facing to teeth of joint cleaning cutter blade.

Hard-Facing Boosts Footage of Joint Cleaning Blades

Joint renovation on old concrete pavement has been handled by contract in many instances in Minnesota. One contractor who has done such work is Ashbak Construction Co., of St. Paul, Minn.

This firm has designed a light-machine for joint cleaning, which looks at first glance like an ordinary pavement saw. The company reported large footages for its cutter wheels, which are coarse-toothed circular saw blades, hard-faced with Stoody Acetylene Tube Borium, of 8 to 12 inch mesh particle size.

The 12-in. diameter blades were torch-cut from ⅜ in. thick carbon steel plate, the arbor hole drilled, and then the teeth hard-faced, using ¼ in. diamond Borium rod.

In the field a single welding operator resurfacing blades can keep six machines in constant operation on a typical project. Repeat applications of Tube Borium serve an average of 130 to 150 ft. of joint cutting and clean-out. Faster coverage of joints as well as longer wear on teeth is reported as a result of this method of hard-facing.

● Toll road receipts are up 19.2 percent on the New York Thruway for the first nine months this year compared to a year ago. The gross revenues total $24,107,933.

Army Engineers Develop Portable Electric Tool Set

Contractors might find much to interest them in a new portable electric tool set designed to help speed construction in forward areas by the U. S. Army Corps of Engineers' Research and Development Laboratories, Fort Belvoir, Va.

Trailer-mounted, the new set is highly mobile and air droppable. Its readily accessible major components include: two 10-in. circular saws, two 24-in. chain saws, two 150 watt lighting fixtures, one ¾-in. reversible electric drill, one ⅝-in. impact wrench, one electric hammer, and one right angle sander.

Power is to be provided by a 3 or 5-kw, 60-cycle, 115-volt engine generator which can be operated either within or outside the standard ¼-ton military trailer.

The tool set eliminates many hand and pneumatic tools and supplements those still required, to give mobile forces of the "Pentomic" Army urgently needed capabilities for quick construction of bunkers and similar emplacements in forward areas. The set will be issued at platoon level in Army engineer combat and construction battalions, and has been recommended for use by infantry units.

Keeping Records Necessary According to Virginia Study

"We have often mentioned the necessity for record keeping in business today," notes a bulletin to members from the Virginia Road Builders Association.

This bulletin remarked on the complexity of legal and tax requirements today. The problem of retention and disposal of records is constantly becoming more and more important.

The bulletin recommended to the contractors of the association, a study completed by the Controllership Foundation Inc., is entitled "Case Studies in Record Retention and Control."

The study notes that there are five points to be considered in setting up record program for any business. These are: 1. a complete inventory of current records, including the extent of use of each type; 2. an appraisal of the value of these records, including legal requirements and the number of copies needed; 3. establishment of a written records retention schedule; 4. a designation of storage facilities and equipment for proper record handling; 5. assigning of responsibility for keeping the record program intact, making transfers and destroying records that have served their need.

The book mentioned is available from Controllership Foundation Inc., 2 Park Ave., New York 16, N.Y. at a cost of $7.50. Records required to be kept on various government projects are listed in the Federal Register Issue of April 11, 1957, available for purchase from the Superintendent of Documents.

OVER 12,000 YDS. A DAY WITH

With 300 h.p. engines and 4 speed Torqmatic Drives, the S-18 Scrapers maintained fast cycle time in spite of the 6500' elevation and steep return grades.

On one side-hill cut the S-18 "Eucs" loaded at the top of the cut and hauled to the toe of the fill—510' difference in elevation!

Loaded by a 4½ yd. shovel, the 22-ton Rear-Dump "Eucs" move heavy excavation from a cut where the granite had to be drilled and shot.

Good stability resulting from the low, wide bowl design, easy hydraulic operation, and plenty of power and traction enabled the "Eucs" to get heaped loads averaging 15 bank yds. of decomposed granite in a hurry.

"Euc" Scrapers are your best investment — have your Euclid dealer show you why!

8 "Euc" S-18 SCRAPERS

on a job so tough that "scrapers couldn't be used!"

Isbell Construction Co. knows what a tremendous difference high production Euclid equipment makes on their earthmoving jobs. Thirty years ago this contractor used a spread of mule-drawn ½ yd. Fresno scrapers in building a road (now U. S. Route 50) through rugged mountain country between Carson City, Nevada and Lake Tahoe.

Today on a nine-mile section of this same road, at about 6500′ elevation, Isbell is relocating the road to eliminate hairpin curves and steep grades. Other contractors who bid the job didn't think scrapers could be used—figured their estimates on the basis of using shovels and trucks to move the more than 3⅓ million yards of excavation. But Isbell had experience with Model S-18 "Eucs" equipped with Torque Converters and knew what these 18 yd. scrapers could do on tough work.

In spite of having to work in close quarters on the mountain side, and climbing return grades as much as 27%, scrapers have moved about 80% of the yardage in cuts up to 230′ and fills to 160′. Eight of the S-18's are working 20 hours a day and on a section with a 400′ one-way haul and return with a 20% adverse grade they complete a cycle in 7 minutes. A fleet of 10 Rear-Dump "Eucs" of 22-ton capacity and three 15-ton models are used where the heavy granite must be shot and shovel loaded.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

◀ Fills on the 9 mile project average 50′ to 100′ in height, with the highest being 190′—they make it possible to keep grades on the new 4-lane road to an average of 5%.

Up and down they go—the S-18 "Eucs" carry their heaped loads of 15 bank yds. or more down 400 feet of 20% grade, dump on the fill, and climb back for another load—each scraper makes 7 to 8 trips per hour. ▶

. . . for more details circle 301 on enclosed return postal card

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

Let "Strapers are your best investment" — have your Euclid dealer show you why!

Culvert on New Kensington, Pa. by-pass. Fabricated from USS Galvanized Corrugated Culvert Sheets by United Steel Fabricators, Inc., Wooster, Ohio. Installed by Adam Eidemiller Construction Company, Greensburg, Pa.

stands up under heavy loads!

Structures made from USS Galvanized Corrugated Culvert Sheets provide a permanent, speedy and economical means of handling road and highway drainage problems. They readily absorb the impact and vibration of modern traffic and can carry heavier loads than rigid-type structures.

These advantages, plus the fact that corrugated metal culverts are not subject to breakage, require no maintenance, cost less to install and are easy to ship and handle, make them ideal for most drainage applications.

For larger drainage structures

USS AMBRIDGE SECTIONAL PLATE is available in a complete range of standard sizes to satisfy design requirements for various types of terrain and waterway openings. These flexible structures with their heavy-duty corrugations can resist extremely large externally applied loads.

• • •

For detailed information, ask for a copy of our 28-page catalog. Send your request to American Bridge Division, U. S. Steel Corporation, Room 1801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS GALVANIZED CULVERT SHEETS

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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7-1004

UNITED STATES STEEL

PETER KIEWIT SONS' CO. produces:

Aggregate and mineral filler for bituminous surface course

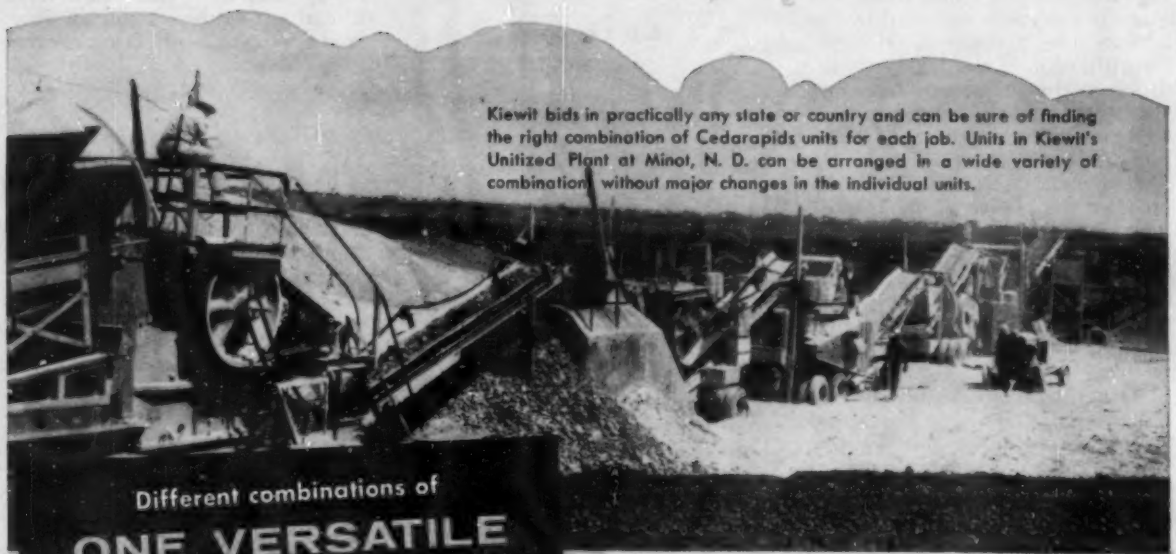
In one arrangement of Cedarapids Units, large size pit material is initially crushed by a 2540 Portable Primary Jaw Crusher and further reduced by an 1836 Primary Jaw. Material then goes through an Intermediate Roll Crusher Scalping Unit and finally a Roll Crusher Secondary Plant. With this efficient combination of Cedarapids units, Kiewit produces minus ⅜" fine aggregate containing rock dust mineral filler, and ¾" surface course aggregate.

Three sizes of aggregate for concrete and binder course

In a different combination of units, the same Cedarapids Unitized Plant produces 1½" concrete aggregate, ¾" concrete aggregate, 1" hot-mix binder course aggregate.

Washed aggregate

From stockpile and double log washer, a Cedarapids 24" x 50' Conveyor delivers aggregate to a Cedarapids 4' x 12' triple-deck Horizontal Vibrating Screen installed over the loading bin and equipped with spray bars for final washing.



Kiewit bids in practically any state or country and can be sure of finding the right combination of Cedarapids units for each job. Units in Kiewit's Unitized Plant at Minot, N. D. can be arranged in a wide variety of combinations without major changes in the individual units.

Different combinations of

ONE VERSATILE CEDARAPIDS UNITIZED PLANT

supply many sizes of concrete and hot-mix aggregates for Minot Air Force Base

The flexibility of this Cedarapids Unitized Plant, and the contractor's ingenuity in varying the unit combinations to meet specifications for both concrete and hot-mix aggregate, assure maximum efficiency at low production cost.

There's a combination of Cedarapids crushing, screening, scalping and washing units that will solve your problem by producing almost any quantity, any specification, and meet practically any production condition. And remember, 100% portability lets you take them where the best contracts are. Ask your Cedarapids distributor to explain Unitized operation and show you how you'll profit.

Cedarapids Built by IOWA

IOWA MANUFACTURING COMPANY / Cedar Rapids, Iowa, U. S. A.

. . . for more details circle 268 on enclosed return postal card

2,102 Miles of New Interstate Routes

THE 2,102 miles of new routes added to the national system of Interstate and Defense highways last month included (1) the 1,000-mile expansion of the Interstate system authorized by the federal-aid Highway Act of 1956, and (2) 1,102 miles of estimated savings in mileage resulting from adoption of more direct locations of routes previously designated.

The plan for the routes, approved by Commerce Secretary Weeks, was recommended by Federal Highway Administrator Bertram D. Tallamy.

Secretary Weeks, in announcing the addition, said the action was taken with the concurrence of the Department of Defense. In developing the plan, consideration was given to proposals advanced by the various state highway departments for utilization of the 1,000-mile addition to the 40,000-mile Interstate system, previously authorized, as well as some other routes of obliviously national significance.

Four basic factors were considered in the choice of the routes. They are:

1. National defense.
2. System integration—the value of the route as a connector between numerous centers of population and industry which generate interregional traffic.
3. Industry—transportation requirements of the manufacturing, agriculture, mining and forestry enterprises in the area traversed.
4. Population.

Under the 1,000-mile addition authorized by Congress in 1956, four city-to-city routes were approved for designation:

- Ellensburg, Wash., to the vicinity of Pendleton. Ore., 132 miles.
- Baton Rouge, La., eastward en route to Mobile, Ala., 91 miles.
- Denver, Colo., to the vicinity of Cove Fort, Utah, 547 miles.
- Fargo, N.D., to Sioux Falls, S.D., 230 miles.

Five New Highways

The routes chosen for designation under the original 40,000 mile authorization include five new city-to-city highways totaling 886 miles and 216 miles in or near urban areas. The city-to-city routes are:

- Canton, Ohio to Charlotte, N.C., 431 miles.
- Pittsburgh to Erie, Pa., 102 miles.
- Ogden to Echo Junction, Utah, 40 miles.
- Nashville, Tenn., to Cairo, Ill., 170 miles.
- San Antonio to Corpus Christi, Texas, 143 miles.

In addition, the 216 miles include: urban connections in Chicago, Philadelphia, St. Louis, Washington, D.C., Kansas City, Louisville, Omaha and Duluth, as well as the earmarking of mileage to provide circumferential or belt routes for cities of more than 200,000 population where routes already designated fail to provide such facilities.

Cities Involved

The cities involved are Cincinnati, Ohio; Louisville, Ky.; San Diego, Calif.; Akron, Ohio; Springfield-Holyoke, Mass.; Dayton, Ohio; Hartford, Conn.; Oklahoma City, Okla.; Syracuse, N.Y., Jacksonville, Fla.; Scranton, Pa.; Salt Lake City, Utah; and Sacramento, Calif.

Secretary Weeks directed the Bureau of Public Roads to issue letters of approval for all routes in the group which have already been proposed by the state highway departments and to open discussions on the remaining routes to accomplish early designation through coordinated state and federal action.

The Secretary said that inclusion of the new routes in the Interstate system would greatly enhance its value as a transportation network, opening new arteries for the interflow of people and goods between important regions of the nation.

Residents and industries in large areas of Ohio, West Virginia, western Pennsylvania and western New York, as well as those of Florida, Georgia, South Carolina and a large part of North Carolina and Virginia lack adequate highway connections between the two regions. Likewise, St. Louis, Kansas City and areas to the northwest had no Interstate route connecting with the southeastern region of the United States. The Pittsburgh-Erie, the Canton-Charlotte and the Nashville-Cairo additions make up for these deficiencies.

The route westward from Denver is a modification of one proposed by the states of Colorado and Utah. The proposal involved a route from Denver to Spanish Fork, Utah, en route to Salt Lake City which would largely duplicate service provided by the designated Denver-Cheyenne-Salt Lake City route. By bending the western end of the route southward to provide a direct connection between Denver and southern Utah, it will be possible to serve traffic moving back and forth between southern California and the Denver region.

The Sioux Falls-Fargo connection completes a link in a continuous route of continental importance running from Mexico City to Winnipeg, Canada. The route from Ellensburg to the vicinity of Portland completes a direct connection from the port of Seattle to the interior.

Short Route

The short route extending eastward from Baton Rouge is a link in an east-west route located inland from the exposed and vulnerable coast across southern Louisiana and Mississippi. The 40-mile cutoff between Ogden and Echo Junction is needed for service to traffic between the northwestern states and the interior.

Since passage of the Federal-aid Highway Act of 1956, some 1,950 miles of the system have been placed under construction.

Federal Highway Administrator Given Appraisal Authority

Secretary of Commerce Weeks has issued an order giving the Federal Highway Administrator authority to negotiate contracts in connection with the Federal highway program.

Under Reorganization Plan No. 5 of 1950, the Federal Highway Administrator is authorized to exercise the authority delegated on August 23, 1957, to the Secretary of Commerce by the Administrator, General Service Administration, to negotiate without advertising contracts with individuals or firms for appraisal services deemed necessary by the Bureau of Public Roads.

LETTERS
To the Editor

To The Editor:

I have read your various editorials on the need for planning, with more than passing interest. As you know, up to now cities and urban areas have been the orphans in the highway picture.

After an upsurge of interest from about 1943 to 1946, when the highway planning surveys and origin-and-destination surveys were being undertaken by the state highway department with cooperation of the Bureau of Public Roads and the cities, these preliminary plans gathered dust. With subsequent unprecedented increase in traffic volumes and increased costs of building highways, it appeared that some of these necessary highways could not be built for generations.

The Federal Highway Act of 1956 has changed all this, and even now a start has been made on some of the urban projects. Due to urgent traffic needs here, a very substantial proportion of the cost of the Interstate system will be for right-of-way and construction in cities.

With this enormous construction program, the greatest peacetime project ever undertaken, comes the responsibility to cities for adequate planning. While the route of such highways must generally follow that indicated by traffic needs, it is possible that along these routes new life may be installed in the physical development of substandard areas. Urban renewal and development may be undertaken along these routes to the benefit of the city and everyone concerned. The well-landscaped area adjoining the expressways to be constructed will be of aesthetic benefit to adjacent property and ease of transportation will be an incentive for the placing of commercial developments along these highways where zoning permits.

The engineering departments of the state and city must work closely with city planning boards, housing and redevelopment authorities, and civic and commercial organizations. From the design standpoint, the city network of streets as well as trunk highways not on the Interstate system must be integrated with the system. Well-designed projects will become a distinct asset to cities. This is an opportunity for cities to take a great step forward in planning for the future.

George M. Shepard
Street and Highway Engineering Coordinator
City of St. Paul, Minnesota

To the Editor:

May we commend you for your idea, expressed in a recent editorial of lighting highways for 3-shift, night-day operation.

We now recommend lighting for continuous stretches of highways, as in the case of the 53-mile Connecticut Throughway, where interchanges or other areas of driver decision are close together. Where these areas occur, approximately one mile apart or less, there is not sufficient time for the eye to re-adjust between lighted interchanges, for example, and the unlighted stretches which might separate them. At modern speeds of 60 mph, this means less than one minute between each of such areas.

Continuous lighting is also justified, we feel, where the highway runs within urbanized areas. It looks to us like such areas will constitute no more than 7 percent of the total 41,000 miles of new interstate highway, but with high right-of-way and construction costs, upwards of 50 percent of the funds could be expended in these areas. Some quick figuring shows that lighting would be an infinitesimally small part of such construction costs.

The other six of the "Seven Deadly Areas" are (1) bridges and viaducts, (2) tunnels and underpasses, (3) access roads and acceleration lanes, (4) at-grade crossing (if any on this new system), (5) interchanges and (6) service areas. These, again, are areas of motorists decision where he needs every bit of help he can to make the right choice of driving reflexes and quickly enough so that he may have a second chance if he makes the wrong decision the first time.

This "little extra time" that can save his life is the role of roadway illumination.

We are very glad to see you treat the subject editorially for we feel very honestly that it needs the full and frank discussion of all those involved in making these highways thoroughly safe and modern.

J. C. Boyter
General Electric Company
Outdoor Lighting Department
Hendersonville, N. C.

Polyethylene Film For Curing Concrete Pavement

Shown here is a section of the Southern State Parkway recently under construction in New York. The contractor, John C. Peterson Construction Company, Baldwin, N. Y., is using Visqueen film, a polyethylene material, as a curing cover. Seamless 14 x 175 ft. white opaque sheets are held down with gravel placed along the edges. These handy, labor saving sheets are .004 in. thick and weigh less than 20 lb. per 1000 sq. ft.

• Aluminum piping is used increasingly by contractors for compressor trunk lines, water supply (jetting of fill, shown here), concrete pumping and other uses.

Aluminum's Growing Role

How this light-weight, labor-saving and weather resistant metal is serving in highway design and helping contractors on the job.

By Duane L. Cronk

Washington Editor of Roads and Streets

ALUMINUM—the key metal of the 20th century—has become a familiar highway construction material over the past few years. During the 1957 summer, however, engineers did a "double-take" at a bit of news from the East Coast. In announcements about the opening of the Walt Whitman Bridge at Philadelphia—one of America's largest suspension spans—aluminum manufacturers proudly pointed out that nearly one million lbs of the "miracle metal" has gone into its appurtenances.

The wide variety of ways in which designers utilized aluminum in the Delaware River crossing reveals how versatile the light-weight metal has become in bridge and highway applications. A survey of aluminum products installed on the Walt Whitman Bridge reveals the following:

• Ten all-aluminum overhead *traffic light bridges* spanning the 7-lane roadway. Each weighs 5 tons, including a built-in catwalk for easy maintenance.

• Six all-aluminum overhead *sign trusses*. Some 75,000 lb. of aluminum went into fabrication of these trusses, which were designed to hold large directional signs. One is the largest ever fabricated of aluminum, a 140-ft.-long structure which will carry a 5-ft. high sign over its entire width.

• 475 special design aluminum *light standards*.

• A mile-long aluminum *grating sidewalk* for maintenance men and motorists who have car trouble.

• More than 4 miles of aluminum *panel railing* on the bridge, plus 3 miles of *parapet railing* along the approaches.

• Aluminum *chain-link* fence protects approaches to the bridge, and the structure itself has been painted entirely with aluminum paint.

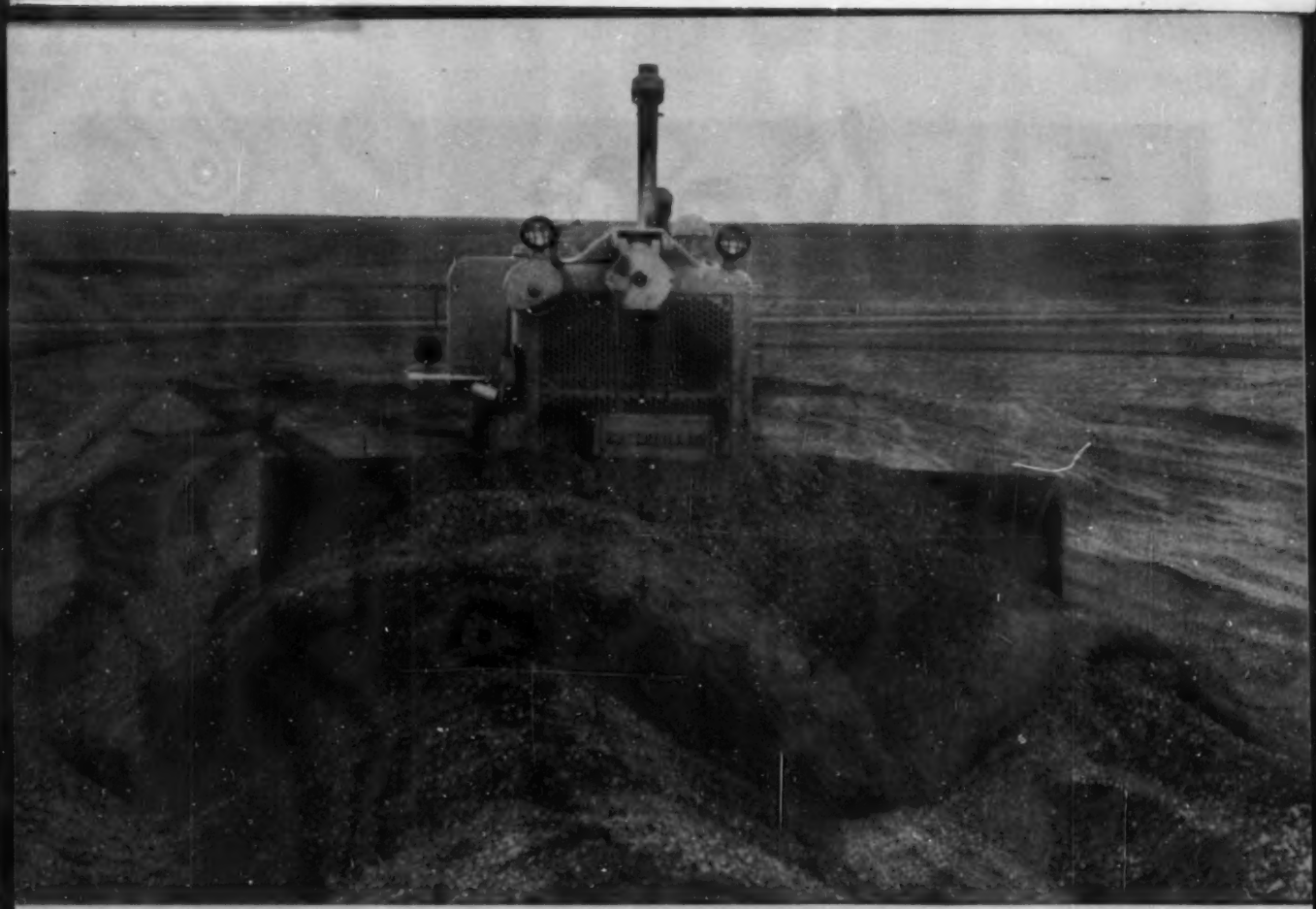
Highway engineers see the unparalleled use of aluminum on Walt Whitman Bridge as a harbinger of things to come. The Bureau of Public Roads estimates that 500 million pounds of aluminum will be utilized in federal-aid highway construction over the next 13 years.

The metal's characteristics have made it "a natural" for signs, lighting standards, fences, and the other accessories which are constantly exposed to weather. As the industry publicists point out in their battle-of-economics with other materials:

• It does not rust or corrode, is unaffected by rain, sun, vermin or fungi. Consequently it does not require painting, a costly maintenance chore on bridges particularly.

• Its light weight cuts shipping costs, makes for easier handling and lower labor costs in the field.

(Continued on page 74)



Northwestern Engineering Co.'s D8 works fast

stockpiling hot mix material for 17 miles of road

You can see the hot mix material "flow" ahead of the blade in this picture—seven or eight tons of it at every pass. The Caterpillar D8 Tractor shown is equipped with a No. 8U Bulldozer. It's used in stockpiling 110,000 tons of base course material, 36,000 tons of hot mix and 7,000 tons of shoulder material—all of which will be used to surface 17 miles of new road near Newell, South Dakota.

This is one of the four D8s owned by Northwestern Engineering Co., Rapid City, S. D., on this project. In addition they have a CAT* No. 12 Motor Grader and two Caterpillar Engines powering the crusher. Superintendent Glenn H. Kistler says: "I've been operating Cat-built equipment for over thirty years, back to the days of the old Sixties, and have always had a preference for the big yellow machines."

. . . for more details circle 243 on enclosed return postal card

Backed by the power and traction of the D8, the No. 8U Bulldozer is a big-capacity tool for handling any type of loose material. It's scientifically shaped to roll the load forward and *inward* with a minimum of side spillage. And it's ruggedly built to stand up under hard, steady work.

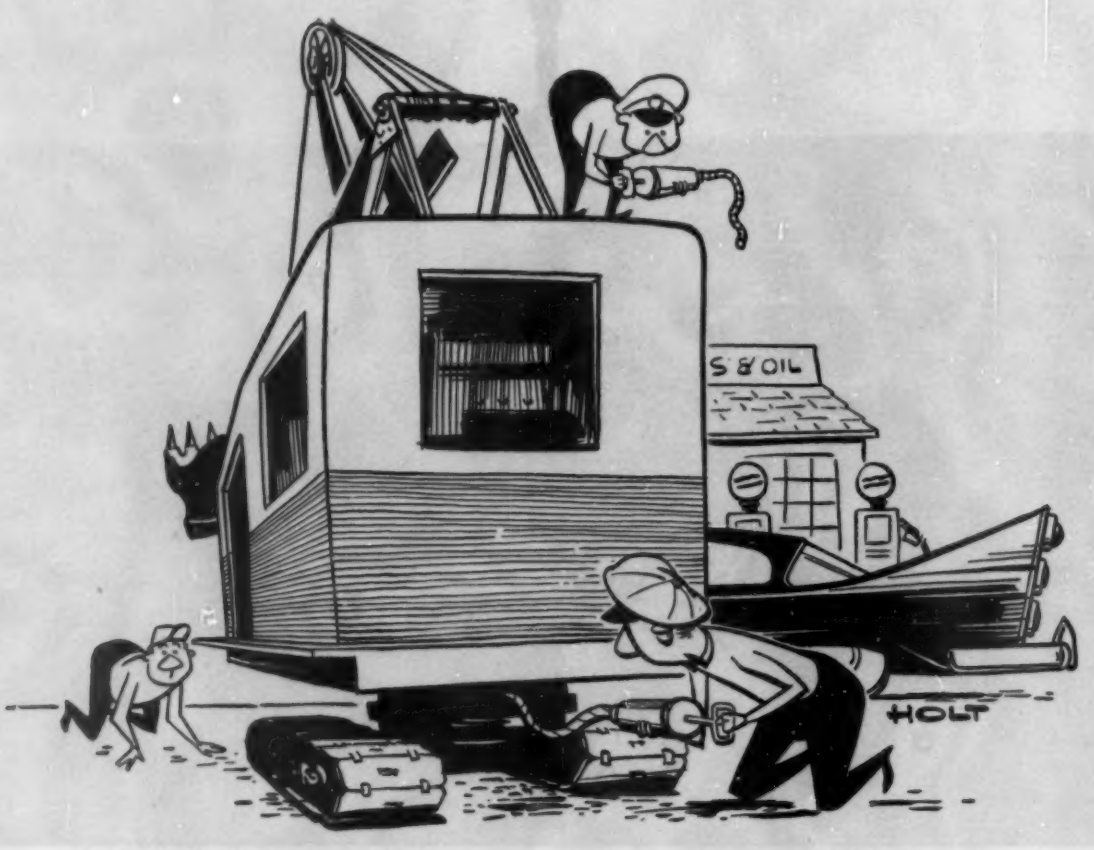
Your Caterpillar Dealer will gladly demonstrate the D8-No. 8U combination on your own job. You can count on him for reliable service and quality Caterpillar parts to keep your machines producing throughout their long work life.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

WANTED—
THE HARD WORK



Why use automobile grease in heavy-duty equipment?

Let's not kid ourselves about the difference between the lubrication requirements of automobiles and heavy-duty machinery. D-A Lubricants are compounded specifically for heavy-duty equipment. There is a right one for every application.

For example, D-A Track Roller Lubricant • D-A Winter Track Roller Lubricant • D-A Open Gear • D-A Torque Fluid • D-A Lithium, Extra-Heavy • D-A Transmission Lubricants • D-A Gun Greases.

Let your D-A Representative give you all the facts on how D-A Lubricants can reduce parts wear and minimize downtime . . . *increase the return on your equipment investment.*

D-A Lubricants make equipment last longer

D-A LUBRICANT COMPANY, INC. • Indianapolis 23, Indiana

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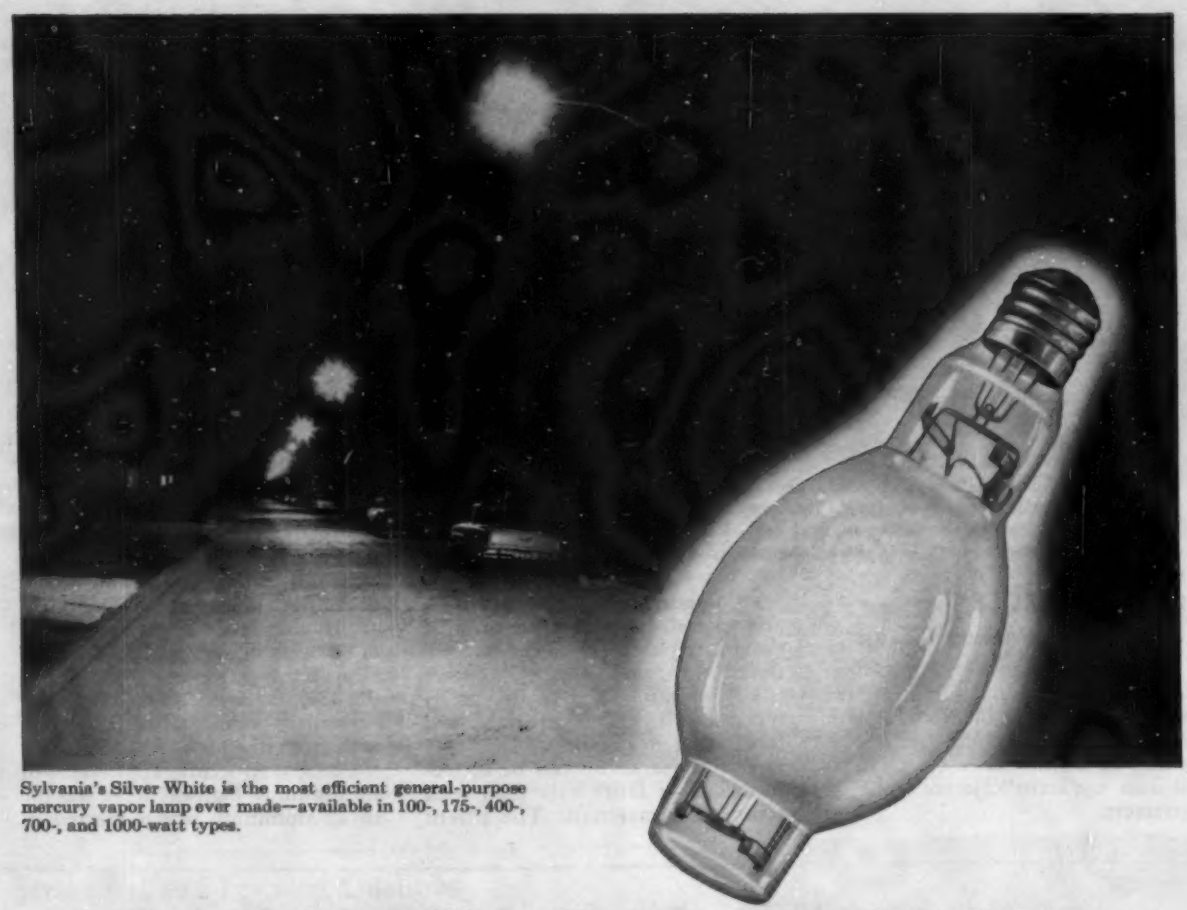


Sylvania's Silver White is the most efficient general-purpose mercury vapor lamp ever made—available in 100-, 175-, 400-, 700-, and 1000-watt types.

Sylvania's Silver White Mercury Lamp gives Chicago 60% more light—reduces power costs 30%—cuts replacement 50%!

The city of Chicago is now changing over from its present incandescent street lighting to new Sylvania Silver White Mercury Vapor Lamp lighting —and with good reason!

By using Sylvania's 100-w. Silver White lamp, street light output has been boosted from about 2500 lumens to 4000 lumens per lamp—lighting sidewalks, lawns and homes that previously got little or no light.

In addition, wattage consumption was reduced from 189 watts per incandescent lamp to only 130 watts for the Silver White lamp and ballast combined—a substantial power reduction of more than 30% per lamp!

Lastly, replacements will be reduced some 50%. This important work- and money-saving change is the result of the Silver White lamp's 6000 hour rated life as compared with the 3000 hour group replacement life of the incandescent lamp.

Combine with these important economies the added benefits of crime reduction, traffic safety, and community pride. Together, they represent the major reasons why Sylvania Silver White Lamps are fast becoming the standard for mercury vapor lighting on streets and highways across the nation.

Sylvania's Silver White is actually the most efficient general-purpose mercury lamp ever made . . . delivers as much as 20% more lumens than previous color-improved lamps of equal wattage . . . yet costs no more to buy or use.

Let your Sylvania Representative demonstrate the service superiority of the Silver White—and the important economies it can offer you. Call him today . . . or write:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Dept. 7L-7212
60 Boston Street, Salem, Mass.

In Canada: Sylvania Electric (Canada) Ltd.
Shell Tower Building, Montreal

SYLVANIA

...fastest growing name in sight!

LIGHTING • RADIO • ELECTRONICS • TELEVISION • METALS & CHEMICALS

... for more details circle 285 on enclosed return postal card

● Handrailing for bridges and grade separations has "gone aluminum" increasingly on the basis of durability, low maintenance and ease of field assembly, as well as the factor of first cost. Various fabricators, in offering a choice of designs, have brought a long-needed semi-standardization.

GROWING ROLE

(Continued from page 70)

• Its appearance is pleasing. Aluminum alloys have an attractive silvery tone which blends well with other construction materials. The oxide of aluminum is colorless, so it does not stain adjacent stone or concrete.

• Components are easily available and special shapes to meet original design requirements can be produced at reasonable cost.

• Aluminum alloys are easily fabricated by all the established fabricating techniques. In many cases the operations can be accomplished at a faster rate than with competitive materials. The advent of fluxless welding systems has made it practical to obtain sound and attractive appearing welds.

• The lightweight feature of aluminum alloys adds to the practicality of shop fabricating subassemblies. Also, light weight simplifies erection operations and in many cases eliminates the necessity of heavy-duty lifting equipment. The strength-weight ratio of the alloys recommended for highway applications is high.

• Aluminum alloys are competitive with other railing materials on the basis of first cost as demonstrated on recent installations. This is also true for signs.

Most of these advantages have only in recent years been realized by road-builders, although architects and engineers in building construction have been making much use of the aluminum for some time. (Pure aluminum has a strength of 11,000 psi, but standard structural alloys are brought up to 40,000 psi, the same as mild steel, and high-strength alloys can be produced with strengths up to 85,000 psi.)

The first structural application of aluminum in highway work was for an all-aluminum bridge erected in

Highway Contractors Too Profit From Aluminum's Many

Aluminum has become a popular material in contractor's equipment these days. The contractors interest is in weight reduction and consequent saving in transporting and handling costs.

• *Growing Uses.* Contractors are using aluminum today for air supply pipe between the compressor and the rock fills on excavation work, for scaffolding, for overpass and bridge decks, for heavy aluminum framing on bridge projects, and for water supply on construction (irrigation borrow pits, supplying sprinkler loading stations from the pump location, etc.)

• *Construction Bridges.* An aggregate producer in Canada has built a welded aluminum bridge to carry a 30-in. wide conveyor belt and catwalk across a river separating his gravel pit and crushing plant. The 180-ft. installation saves a two-mile truck haul.

• *Concrete Forms.* Aluminum forms that are easily assembled for concrete pouring, and just as easily dismantled when the job is done, are being used for concrete tunnel and gallery construction in Europe. The forms can be used many times, handled easily, shipped cheaply, and unskilled labor

● Aluminum falsework truss, designed and fabricated specially for use by the contractor in setting steel truss spans for the Richmond-San Rafael bridge in California.

● Aluminum truck body still in the experimental stage with some manufacturers, but giving promise of economies due to weight saving.

Arvida, Quebec, in 1950. Engineers claimed savings in shipping costs (a steel structure would have weighed 875,000 lb. compared to the aluminum's 380,000 lb.) and in reduced maintenance.

English engineers have constructed a $340,000 all-aluminum draw bridge.

Aluminum Road Bridge

In this country, plans are being completed now by the Iowa Highway Research Board for an aluminum road bridge to be built near Des Moines, and the New York state department of public works is considering plans for two small aluminum bridges. Today 42 states already have written aluminum somewhere into state highway specifications. Practically every state is considering some application of the metal for highway construction. Aluminum signs, for example, are in use in 37 states.

A number of the largest consulting engineering firms now working with state highway departments recommend aluminum exclusively for bridge railing.

Aluminum has been used in the highway field since 1928, when the designer specified specially cast ornamental aluminum panel sails for the LaSalle St. Bridge, Chicago.

In 1933, bridge men watch with interest as Pittsburgh engineers stripped the old Smithfield Bridge down to the trusses and put in aluminum stringers, joists, floor beams, deck and railings. The object was to reduce the dead weight and prolong the life of the structure until it was possible to raise a bond issue for a new one. The bridge is still in use 25 years later.

● **Aluminum is a chief contender in the specification of light standards and brackets. Forests of poles such as this may help light hundreds of miles of new expressways in the next few years. (Photo courtesy Union Metal & Mfg. Co.).**

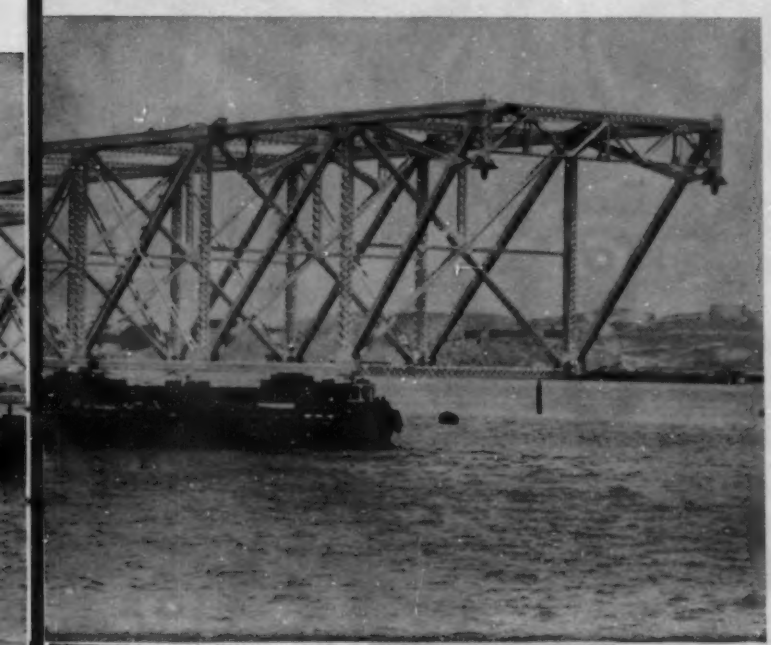
Structural and Forming Qualities

can assemble them.

● *Falsework.* Contractors on the Richmond-San Rafael Bridge across San Francisco Bay used 280-ft. aluminum truss spans as a work platform on which to erect the steel truss spans being incorporated into the structure. The aluminum falsework was installed and reinstalled between piers and the steel bridge spans formed in place on top.

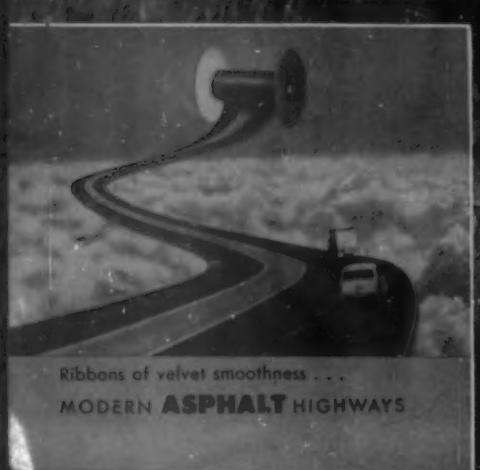
● *Booms.* Aluminum booms or upper boom sections are speeding swing cycles on cranes and draglines.

● *Buildings.* Field shops, offices and commissaries of the light-weight metal are being used by many contractors today.



● **Another contractor's water line, of aluminum—8,500 ft. of 8-in. pipe was installed by Geo. M. Brewster & Son for supplying compaction and mix water, for large eastern air base project in 1957.**

Rugged ASPHALT paving saves



Washington $30,000 a mile

...Saves State $381,000 in first cost on 12.7 miles of Interstate Highway. Maintenance savings expected, too!

For the Prairie Creek to Tumwater section of U. S. Highway 99, the State of Washington chose modern Asphalt pavement.

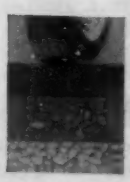
By so doing it saved thousands of dollars in initial costs alone. The entire paving cost for 12.7 miles was $826,978 . . . with savings of $30,000 a mile compared with a connecting slab-paved section. *And more savings are to come . . . for Washington's records indicate that Asphalt pavements cost less to maintain.*

As records show in state after state, modern Asphalt highways are not only economical but also rugged and safe.

Rugged . . . because layer-upon-layer construction "locks" surface to the foundation, builds up strength and resilience.

Safe . . . because modern Asphalt pavement is traction-textured for high skid-resistance. There is less glare . . . greater traffic-line visibility.

In winter, snow melts faster and Asphalt pavement is not harmed by de-icing chemicals.



ENGINEERED FOR RUGGED WEAR

Modern Asphalt construction is a triumph of road-building science. Built-up layers spread the load . . . absorb shock and pounding. Economy, safety and comfort are built-in to last.

THE ASPHALT INSTITUTE
Asphalt Institute Building, College Park, Maryland

. . . for more details circle 236 on enclosed return postal card

- **Earliest use of aluminum railing was in these ornamental cast aluminum panels on Chicago's La-Salle Street Bridge, typical of the "custom job" type of use aluminum was once restricted to.**

- **First major use of aluminum parapet-type bridge railing was on the Ohio Turnpike, where this design prevails. Big share of the 212,000 lineal feet of railing is of aluminum.**

- **Aluminum bridge railing is now recommended exclusively by twelve of the largest consulting engineering firms working with state highway departments. (Reynolds Metals).**

Aluminum Handrails Come In Many Available Designs

GROWING ROLE

(Continued from page 75)

It was the evolution of the modern superhighway, however, that brought aluminum out of the "custom-job" classification. The new toll roads with their limited-access design, called for hundreds of bridges (all requiring railing) and thousands of signs (larger, for high-speed traffic). The material's strongest selling point—low-cost maintenance—came under the spotlight on these projects, where upkeep was as carefully estimated as initial cost.

First Utilization

The Ohio Turnpike brought out the first major utilization of aluminum bridge rail and directional signs. About 80 percent of the 212,000 lin. ft. of railing on the big project "went aluminum" as the result of lower-first-cost bids. On billions of dollars worth of other turnpikes, aluminum came into wide use—for bridge railing, signs and sign posts, and lighting standards. Such products have been incorporated in a large scale on projects like the Pennsylvania, New Jersey, Kansas, Indiana, Massachusetts, and Oklahoma turnpikes. Aluminum railing will be much in evidence on the Northern Illinois Toll Road.

Aluminum light standards have come into popular use in recent years and have been specified as standard in some cities. Philadelphia, particularly, has pioneered experimentation in this application. With about 4,000 aluminum poles already in place on the streets, city engineers are now swinging to aluminum standards in new alley installations.

Some 3,500 aluminum light standards will soon be installed at points on the Greenwich-Killingsley Expressway in Connecticut, an unusually large highway lighting undertaking.

Bright Future

Manufacturers see a bright future for structural aluminum in large bridges where the possibility of reducing dead weight would permit more imaginative design. Price increases of steel are closing the initial-cost gap between the two materials, they claim.

In the meantime, the increasing appearance of aluminum along the highways will undoubtedly be in the appurtenances mentioned above—bridge railings, signs and lighting standards—especially on the thousands of miles of highways and bridges of the new National Interstate System.

Signs Being Designed

Road signs are being designed increasingly with aluminum in mind. Some 7 million signs a year must be replaced. In addition, completed sections of the national Interstate systems are expected to require many thousands of signs a year, some of radically new design.

The number of signs needed will vary greatly depending on the density of population in the area traversed. The toll roads have hinted at the size of this market. For example, in addition to a large number of aluminum sheet signs, about 450 extruded aluminum signs, ranging in size from 9′ x 3′ to 23′6″ x 11′, were erected on the 150-mile Indiana Toll Road, an average of three signs per mile. Seventy extruded signs were put up on the 40-mile Kentucky Turnpike—or 1.75 signs per mile. The 30-mile Detroit-Willow Run Expressway required 185

● **Fast installation: Light-weight of aluminum signs and truss make installation fast and easy. This long span reportedly went up in five minutes.**

similar signs for an average of over 6 signs per mile.

On the first leg of the Florida Turnpike, a distance of 110 miles from Miami to Fort Pierce, 320 extruded aluminum signs will be erected—an average of nearly 3 per mile. The first leg of the Congress Street Expressway in downtown Chicago required 80 signs for a distance of about 3 miles, or 26 per mile.

"It is probably a fair estimate that well over 200,000 such expressway signs will be erected during the next decade," one industry official said recently. "Assuming an average sign face area of 100 sq. ft. and an average weight of 220 lb. per sign, this would add up to a potential of 44,000,000 lb. of aluminum for sign panels alone.

Potential Volume

"To this must be added a potential volume of about 300 lb. per sign—or a total of 60,000,000 lb. for 200,000 signs—for structural aluminum I-beams and tubing for sign posts, overhead spans and supports. It is clear, therefore, that the potential for aluminum in this field during the next decade exceeds 100 million lb. or an average of 10 million pounds per year.

This may be an optimistic outlook, but the growing popularity of aluminum seems to justify it. One leading aluminum producer has engineered a minor revolution in the design of highway signs with development of the new extruded aluminum panels. These can be assembled into highway signs as large as 12′ x 30′ merely by interlocking the required number of panels and attaching them to supporting posts

HOW STATE SPECIFICATIONS VARY FOR ALUMINUM SIGNS

State highway department specifications for signs usually require (1) that the sign be erected on two posts which are located at the one-fifth points, and (2) that it must withstand, with the proper safety factor, a wind load of 30 lb./sq. ft., which is equivalent to approximately 110 mph wind velocity. In some states where hurricanes or tornadoes may strike, specifications are based on wind loads of 35 lb./sq. ft. and even greater.

These conditions determine the section properties required in the extruded panel. Aluminum 6063-T6 alloy is generally used because, for the sections involved, it offers the highest strength per dollar. Mechanical properties of this alloy and temper are: Tensile strength, 32,000 psi; yield strength, 25,000 psi; elongation, 8%.

Specifications of various states and engineering firms vary depending on the maximum fiber stress allowed in the aluminum section for maximum span length. For instance, the Michigan state highway department specifies that a 12-in. wide section is a 20-ft.-long sign shall have a minimum section modulus of 0.18 in.

For a 20 ft. long sign erected on two posts with a center span of 12 ft., this results in a maximum fiber stress of about 20,000 psi, which compares with a minimum yield strength of 25,000 psi in alloy 6063-T6. For signs from 20 to 26 ft. long the Michigan specification further calls for a minimum section modulus of 0.31 in.

Kansas Turnpike specifications required that the aluminum sections be capable of supporting a uniform load of 30 lb./sq. ft. without buckling and without exceeding a maximum fiber stress of 17,000 psi when assembled in 20 ft. long two-post signs. By way of comparison, the maximum fiber stress in an extruded sign panel under the same conditions would be approximately 7,500 psi.

For relatively short spans, the mechanical properties of the lower-priced tempers, 6063-T5 or 6063-T42, provide adequate safety factors and can be specified.

In cases where the sign has to be porcelain enameled —involving heating to nearly 1,000°F. and consequently almost completely annealing the alloy—it is necessary to design the aluminum panel section for a yield strength in the neighborhood of 13,000 psi. In comparison with sections not porcelainized this means that for equal strength a somewhat heavier section must be used, or if the same section is used that the safety factor will be reduced.

—From paper by H. V. Menking
Reynolds Metals Company

● Longest of them yet—the new 140-ft. span aluminum sign bridge, at the toll plaza approaching the Walt Whitman Bridge at Philadelphia. (Pfaff & Kendall photo).

● Aluminum really comes to the designer's rescue here—one of the new all-aluminum tubular sign bridge supports developed by the Connecticut state highway department.

Do-It-Yourself Aluminum Sign Shop

A vacuum applicator has been developed by the Minnesota Mining and Manufacturing Company to apply "Scotchlite" reflective sheeting to aluminum blanks. With this development, the manufacturer claims, even the smallest street or highway department can make its own signs. The do-it-yourself operation can be set up for less than $1,000, including the machine and sign materials. Such a shop would require a space about 20 x 20 feet for a work table, the vacuum applicator and racks for finished signs.

by means of hook bolts. In case of damage through vandalism—biggest single cause of excessive maintenance—only one panel need be replaced, not the entire sign. It's like having to replace only one pane of glass instead of an entire window. For high visibility at night, the signs can be reflectorized with sheeting or by attachment of legends made from reflective buttons or sheeting.

Competition Close

The battle between material industries here is keen. Manufacturers claim even initial cost advantages for the new extruded aluminum panels, one spokesman reported. Bids on superhighway signing submitted by various contractors reflect this. Example: For one of the recent turnpike contracts involving 70 large concrete base signs, a contractor bid $39,919 for material, fabrication and reflectorizing of steel signs plus $47,186 for erection, for a total of over $87,095. The same contractor submitted bids of $41,203 for material, fabrication and reflectorizing of extruded aluminum signs plus $36,086 for erection, for a total of $77,289. Thus the erected aluminum signs were nearly $10,000 lower.

Other sign fabricators have stated that aluminum extruded signs can be fabricated and erected at a cost

● Reflectorized aluminum highway signs like this one are providing maintenance-free protection for motorists on new Kentucky Turnpike. (Reynolds Metals).

competitive to large multi-panel plywood signs. Bracing and splicing are unnecessary for extruded aluminum signs. Since they are only 2 in. thick, a large number of panels can be shipped in a truck load. Their lighter weight also makes them easy to handle and erect.

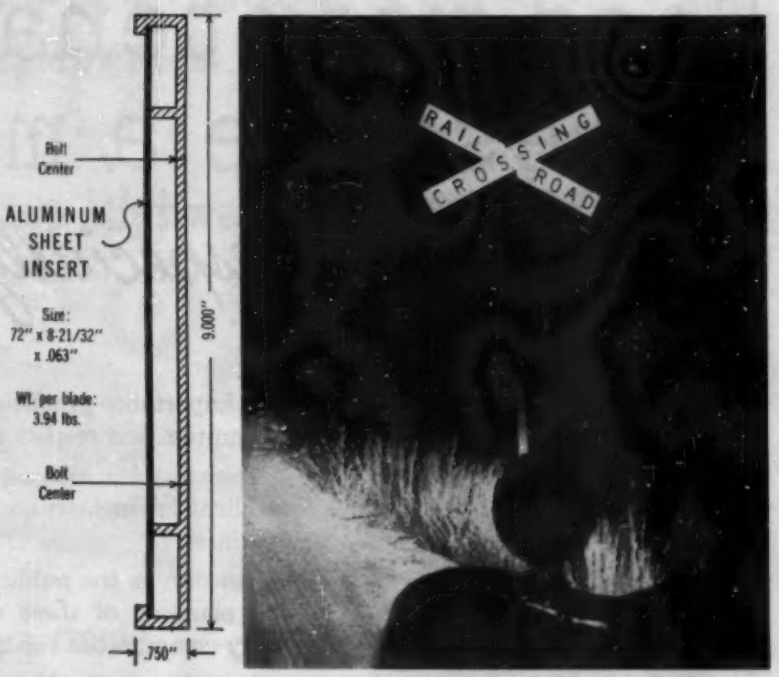
A mile of express highway costs at least $1 million to build; in mountainous terrain the figure may be twice as high. The cost of signs on super-roads is around 0.3% to 0.5% of the total cost. The cost of the aluminum extrusion panels, in turn, is one-sixth to one-seventh that of the erected sign. The aluminum advocates give this reasoning in pointing out that the cost of the basic sign material is relatively small.

Increasing Use

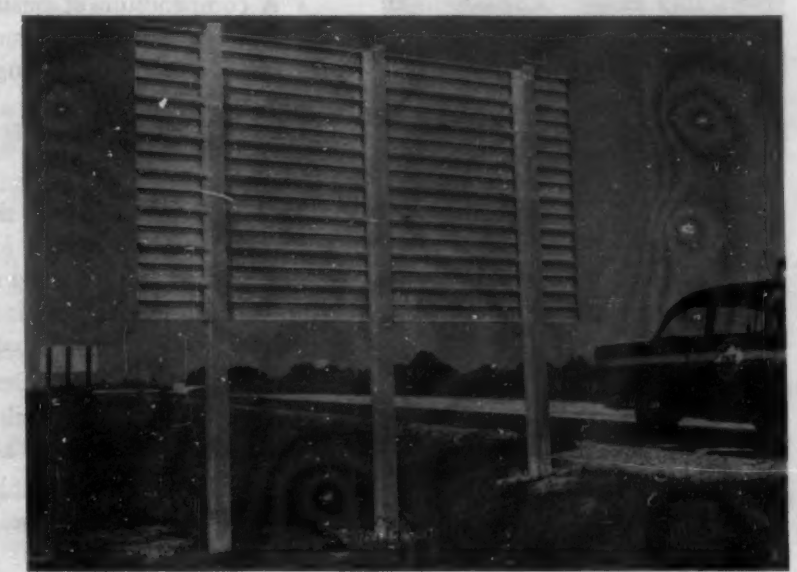
Engineers are using aluminum increasingly, not only for signs themselves, but also for the structures to hold them. The immensity of many of the directional signs required for high-speed superhighways prohibits their erection on the shoulder. They must go overhead. In the last three years, aluminum has become steadily more popular for these large overhead structures, some of which may have to span six lanes.

Because aluminum requires little care, such dangerous operations as repainting while surrounded by fast-moving automobiles is eliminated. Some large spans even have built-in catwalks to make maintenance safer and quicker.

The increasing use of the overhead structure is apparent in the new Greenwich-Killingsley Expressway where engineers have specified 100 overhead spans and 76 structures to cantilever over the roadway. One producer is developing and testing a single-tube structure to possibly replace the truss-type span currently in vogue. Such a member could be produced considerably cheaper than the truss-type, manufacturers believe.



● **Aluminum railroad crossbuck with Scotchlite (Minnesota Mining & Mfg. Co.) lettering gives unmistakable warning at night as well as in daylight. The new crossbuck design featuring an optional removable insert is suitable for use either as double or single-faced warning sign. (Kaiser photo).**



● **Rear view of aluminum highway sign, showing how interlocking Reynolds extruded panels attach to aluminum eye-beams. Such signs, which can be made in a wide range of sizes merely by adding or subtracting panels, are virtually maintenance-free and will resist even hurricane winds.**

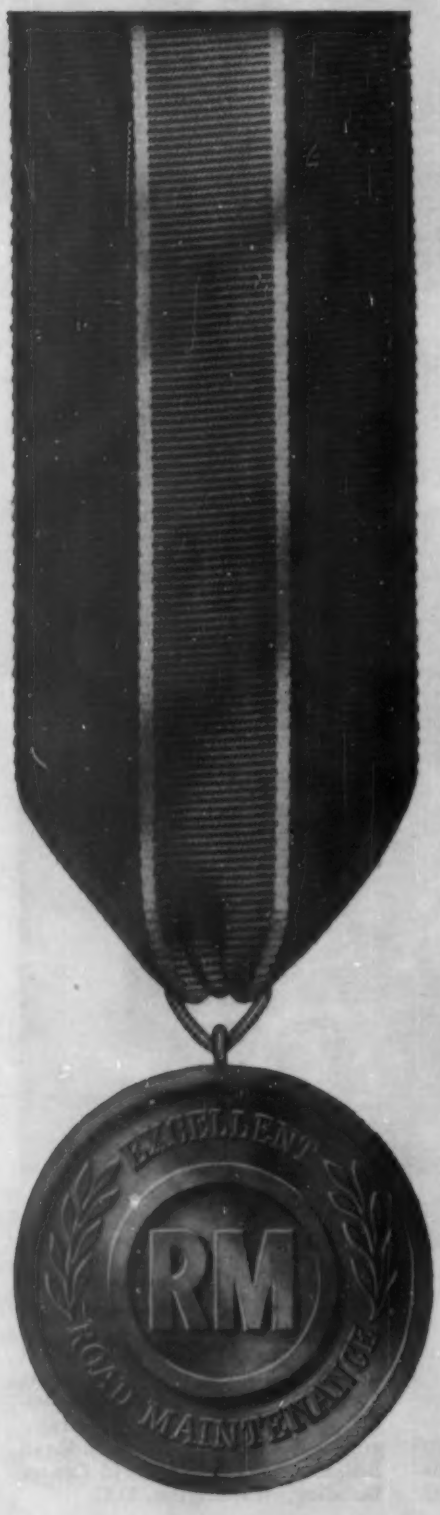
ARBA Plans Movie on Highway Right of Way Problem

The American Road Builder's Association, with financial help from the Construction Industry Manufacturer's Association, is planning two motion pictures in sound and color. The first is entitled "You Take the High Road," and will be a 27 minute dramatization to help engineers and officials in obtaining cooperation and support of local citizens on new locations required for the Interstate highway system.

The second film is a 13 minute one for use in high schools, colleges and on TV, designed to attract men into highway engineering. This film has not been given its final title. Several sponsors are involved in these films, which will be made available to state highway departments, schools and local service groups through the American Road Builders Association-World Center Building, Washington, D.C.

Road maintenance men deserve a medal

(especially in winter!)



The importance of efficient maintenance men is gaining in recognition and respect every year.

The constant increase in vehicular traffic points to the excellent job maintenance men do in summer and especially in winter.

Not only is the public dependent upon the performance and planning of these men, but the economic health of many communities lies in their judgment.

- According to the National Safety Council, accidents due to skidding increase 35% when effective ice control is not practiced.
- A compendium of business reports indicates that retail business falls off as much as 80% when snow and ice cause dangerous driving conditions.
- In a 17-state study, it was found that revenue from gasoline taxes falls off 30% in icy weather when driving is hazardous.

These are but a few of the strong arguments for keeping traffic-ways safe during ice and snow. The fine record of experienced maintenance men points to excellent performance in protecting public safety and in guarding the economic prosperity of the communities.

Now is the time to order Columbia Calcium Chloride for treating abrasive stockpiles, and to have supplies on hand for application with salt at the first winter emergency.

Columbia Calcium Chloride shipments are now being made daily for winter use. We would appreciate the opportunity to serve you. Why not call or write now.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
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IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

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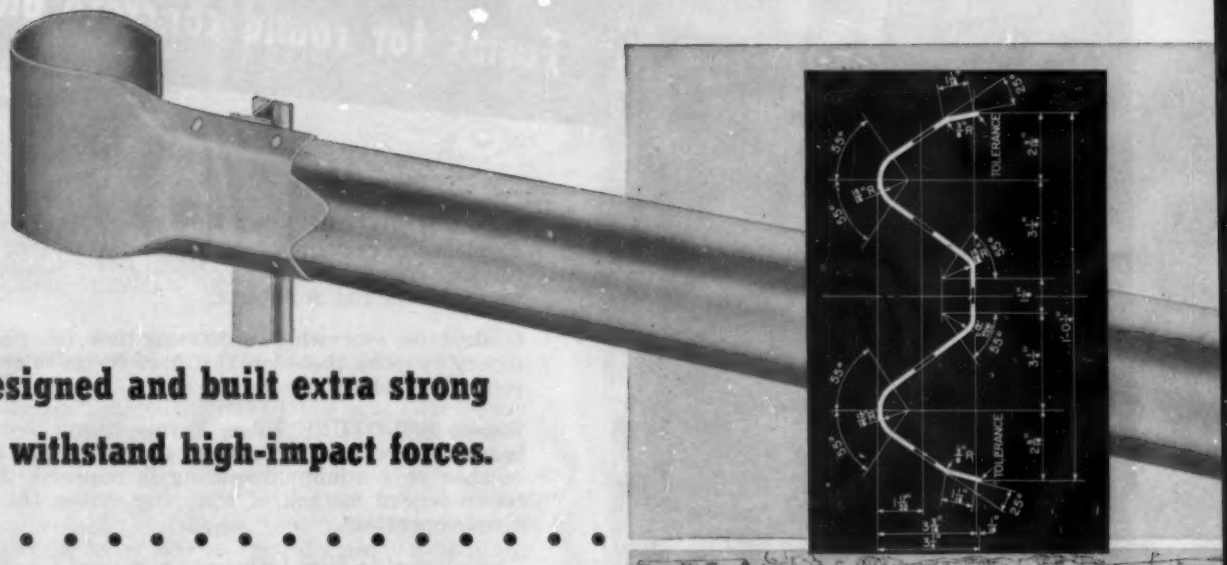
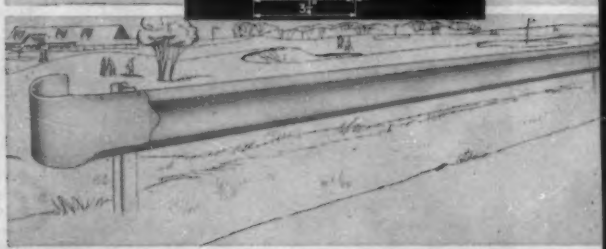
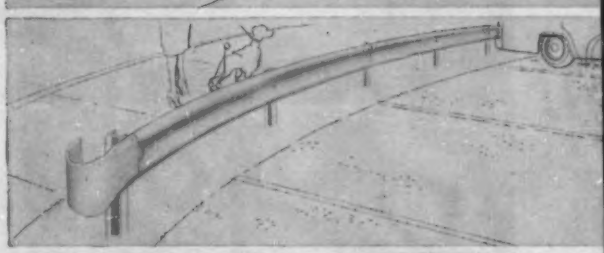
Another Important Highway Product by
AMERICAN BRIDGE

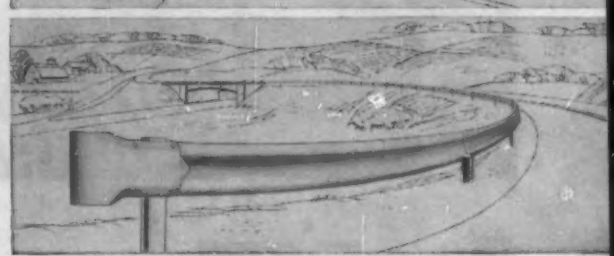
USS AmBridge Highway Beam Guard Rail



Designed and built extra strong to withstand high-impact forces.







Possessing all the design features of the modern universal guard rail section that has been adopted by the majority of State Highway Departments, the new USS AmBridge Highway Beam Guard Rail offers the following extra advantages that make it the finest traffic safeguard available today.

1. All mill scale is removed from the steel before the guard rail section is formed, assuring uniform tenacious paint adherence. *This is a standard specification.*
2. Prior to painting, all sections are degreased, given two hot-water rinses, and oven-dried. Then a coat of rust-inhibiting primer is applied.
3. Specifications include standard ⅝" *high-strength* bolts that conform to ASTM A325.

With its combination of these and other such desirable characteristics as rugged strength, ease and speed of installation, controlled flexibility, high visibility, and negligible maintenance, you can count on unsurpassed economy, safety, and permanence of installation with USS AmBridge Highway Beam Guard Rail.

For a copy of our new descriptive folder, contact our office nearest you or write direct to our Pittsburgh headquarters.

. . . for more details circle 308 on enclosed return postal card

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION · GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

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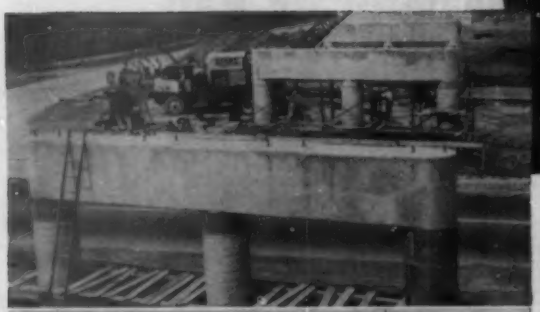
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

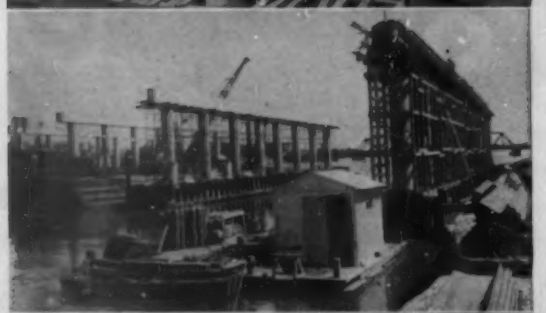
USS **AMERICAN BRIDGE**

UNITED STATES STEEL

LOWER the COST of BR

use SONOCO SONOTUBE® Fibre Forms for round concrete piers





Sonoco SONOTUBE Fibre Forms were specifically developed to provide a fast, economical method of forming round columns of concrete . . . approved by engineers and architects.

Contractors everywhere are saving time, labor and money by using these low-cost fibre forms to erect piers for bridges and overpasses.

Sonoco SONOTUBE Fibre Forms handle easily because they are lightweight and erect quickly because only minimum bracing is required. The recommended method of stripping makes this a simple operation.

These versatile fibre forms are also used for economical encasement of columns, piers and piles, underpinning, stub columns for light standards, quarter, half and obround columns. Beam and wall tie-in is easy.

Save time, labor and money . . . use Sonoco SONOTUBE Fibre Forms!

(Photos top to bottom)

New York State Thruway, Overpass bridge West River Parkway near Grand Island, N. Y. Contractor, Hendrick Construction Company.

North-South Freeway Bridge over Providence River, Providence, R. I. Contractor, M. A. Gammino Company.

Wisner Drive Overpass, New Orleans, La. Contractor, Keller Construction Corporation.

Bridge over State Routes 22 and 23, Circleville, Ohio, Contractor, C. F. Repogle Company.

Order Sonoco SONOTUBE Fibre Forms in sizes from 2" to 48" I.D. up to 48' long. Specify lengths or saw to your requirements on the job. Sonoco's patented "A-coated" SONOTUBE for finished columns; wax-coated also available.

See our catalog in Sweets . . . for co

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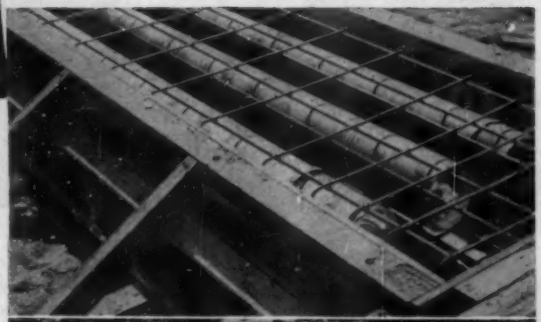
LOS ANGELES, CALIF.
5955 SOUTH WESTERN AVENUE

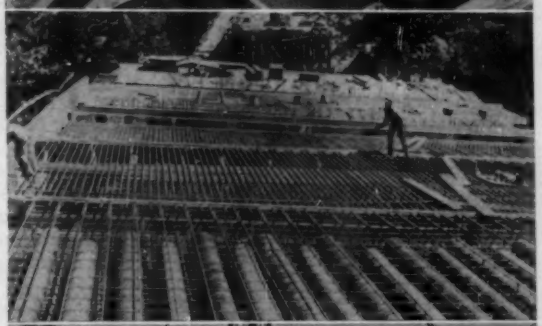
AKRON, IND.

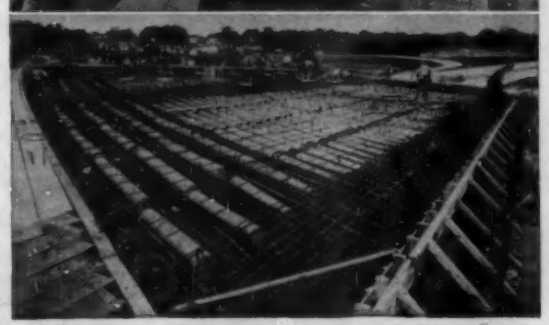
LONGVIEW, TEXAS

IDGES and OVERPASSES

use SONOCO SONOVOID® Fibre Tubes to form voids in concrete decks







Sonoco SONOVOID Fibre Tubes were specifically developed to form voids in bridge decks and concrete piles and in wall, floor, roof and lift slabs. For precast units or units cast-in-place.

They are particularly adapted for use in prestressed, precast concrete pile construction.

Low-cost Sonoco SONOVOID Fibre Tubes save concrete and reinforcing steel . . . they save weight by displacing low-working concrete at the neutral axis.

The versatility of these fibre tubes is proven in that they have been successfully used as ducts for wiring and piping in building construction and as service conduits to carry electrical, gas and water service through the decks of elevated structures.

Easy-to-handle and simple-to-place Sonoco SONOVOID Fibre Tubes save time, labor, money and materials!

(Photos top to bottom)

Eureka Slough Bridge, Eureka, California. Contractor, Ben C. Gerwick, Inc.

Dog Creek Bridge near Redding, Calif. Contractors, Ukropina, Polich, Kral, Ukropina & Weidmer.

Corning Canal Bridges near Redding, California. General Contractor, J. H. Trisdale.

Waugh Memorial Bridge, Houston, Texas. Contractor, Constructors, Inc.

Order Sonoco SONOVOID Fibre Tubes in sizes from 2.25" to 36.9" O.D up to 48' long. Specify lengths or saw to your requirements on the job. End closures available.

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Personals

sion, has been made assistant chief engineer for roadway and right-of-way.

This rounds out a re-vamping of the commission's staff which formerly entailed 27 departments reporting to chief engineer W. H. Rogers, Jr. These departments now will report to four specialized assistants, chief engineers along with the 14 highway divisions scattered over the state.

Richard H. Wilson Retires

Richard H. Wilson, assistant state highway engineer, California division of highways, has retired after nearly 34 years of service. J. P. Murphy, planning engineer of the division, will succeed Wilson.

Wilson has been part of a team that is characterized as one of the finest ever developed in highway department panels. As assistant state highway engineer on administration during the past ten years, he has been responsible for a wide

range of functions including those of office engineer, city cooperative projects, and service and supplies. He has helped participate in a program currently grown to a $200 million annual rate.

ELLIS L. ARMSTRONG is the new director of the Utah State Road Commission, a $14,000 post created to better handle the enlarged highway program in this state.

Armstrong was a former director of dams on the St. Lawrence Seaway project and has had a wide range of experience. He is a native of Utah.

STANTON WALKER, director of engineering, National Sand and Gravel Association, Washington, D. C., received the Frank E. Richart award at the ASTM's recent annual meeting. This award commemorates Richart, a vice-president and honorary member of the society, and is made at three year intervals or so to encourage research and standardization and to recognize notable contributions in the field of concrete and concrete aggregates.

Commission Chief Engineer Roger B. Stone Resigns

The Pennsylvania Turnpike Commission has announced the resignation of its chief engineer, Roger B. Stone.

Trained at Massachusetts Institute of Technology, Stone first became associated with the Pennsylvania system when he submitted a report in 1936 on the feasibility of Turnpike construction. During his term with the Commission he was charged with the engineering location of the original Turnpike and all five of the extensions comprising the present 470-mile system.

"Our equipment keeps on rolling—

We use Colmonoy No. 2, the Best Hard-Facing!"

You get top abrasion resistance and easy welding with low-cost Colmonoy No. 2 hard-facing electrodes. Use them on tractor treads, dipper teeth, ditcher teeth, truck beds, dragline buckets, any steel or manganese steel part.

Excellent arc stability and good flowing qualities make these low hydrogen AC-DC electrodes a cinch to apply. A Colmonoy No. 2 deposit has a Rockwell C hardness of 50 to 60.

Write today for more information about Colmonoy No. 2 and the rest of the Colmonoy family of hard-facing alloys.

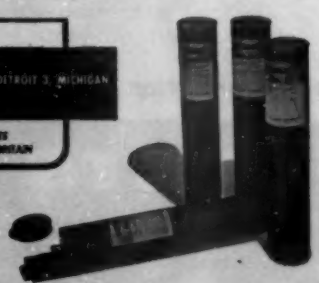
HARD-FACING ALLOYS

WALL COLMONOY

DETROIT 3, MICHIGAN

BIRMINGHAM · BUFFALO · CHICAGO · HOUSTON · LOS ANGELES
LINDEN, N. J. · MORRISVILLE, PA. · PITTSBURGH · MONTREAL · GREAT BRITAIN

Available in 1/8, 5/32, 3/16, and 1/4-inch diameters, packed in 10-lb. sealed metal containers.



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New Surveying Method
Faster and Cheaper than Triangulation

"Tellurometer" used successfully in determining ground control points for location of Virginia Interstate route.

Special Roads and Streets Staff Report

A four-man surveying crew, armed with a new electronic surveying device, is tramping around the Blue Ridge mountains of Virginia this month, making highway history.

The boxlike instrument, with an antenna protruding from a round reflector-like front end and a panel of levers and dials on the back, is a revolutionary distance-measuring mechanism called a Tellurometer. The few highway officials who have seen this strange device predict it will save million of dollars in engineering manpower costs and significantly reduce the tremendous job in establishing ground control points for location of the 41,000-mile proposed Interstate highway system.

The Virginia project marks the Tellurometer's debut in the highway engineering field. In that state, it is expected to cut many months off the total surveying job involved in establishing the hundreds of control survey markers required for locating 1,000 miles of Interstate routes. It is expected to slash the estimated cost from $750,000 to $400,000 there.

One Man Operation

The Tellurometer is a compact electronic device which measures distance by use of microwaves similar to the familiar radar method. A master unit, called the master, sends out microwaves toward a remote unit (which can be up to 40 miles away). The time it takes these waves to return is immediately revealed on a dial in milli-micro-seconds, which, in turn, are easily translated into miles and feet. Only one man is required to set up and operate the portable transmitter, another to operate the receiver. Experienced operators, it is claimed, can set up their gear, take their readings and make their computations in 30 minutes.

Built-in two-way radios make it possible for these men to direct each other and plan their work as they go along. Intervisibility is necessary.

Outmodes Triangulation

The Tellurometer is expected to outmode the traditional triangulation system of establishing points in these instances, particularly in rolling or rough terrain and for measurement of long distances. At close distances the clear-cut advantages of the instrument over traditional triangulation and taping methods diminish, although its makers believe it will be faster and more accurate than the theodolite on stretches as short as 500 ft. Among other advantages of the new device:

- It is accurate to 3 parts per million, plus or minus two inches.
- It is capable of measuring far greater distances than heretofore possible-up to 40 miles, although a clear, non-obstructed line-of-sight is necessary between the units.
- It is not dependent on visibility, can be operated in fog and adverse weather conditions, however the line between units must not be obstructed.

The units are light and portable. One man can pack the Tellurometer, its tripod and battery into points inaccessible by vehicle and set it up alone. Because it establishes traverse lines, it requires only two clear lines of sight directions, thus eliminating the need for much clearing and erection of towers.

The four-man crew now working with the device in Virginia is a United States Coast and Geodetic Survey outfit. Under a special arrangement with the Virginia state highway department, it is establishing stations every three miles down the proposed route of a new U. S. Route 11.

The U. S. Coast and Geodetic Survey has utilized the device in the Aleutian Islands. There, where the fog-bound high points are invisible for days on end, and optical methods are extremely uncertain, it proved invaluable.

120 Miles in 4 Months

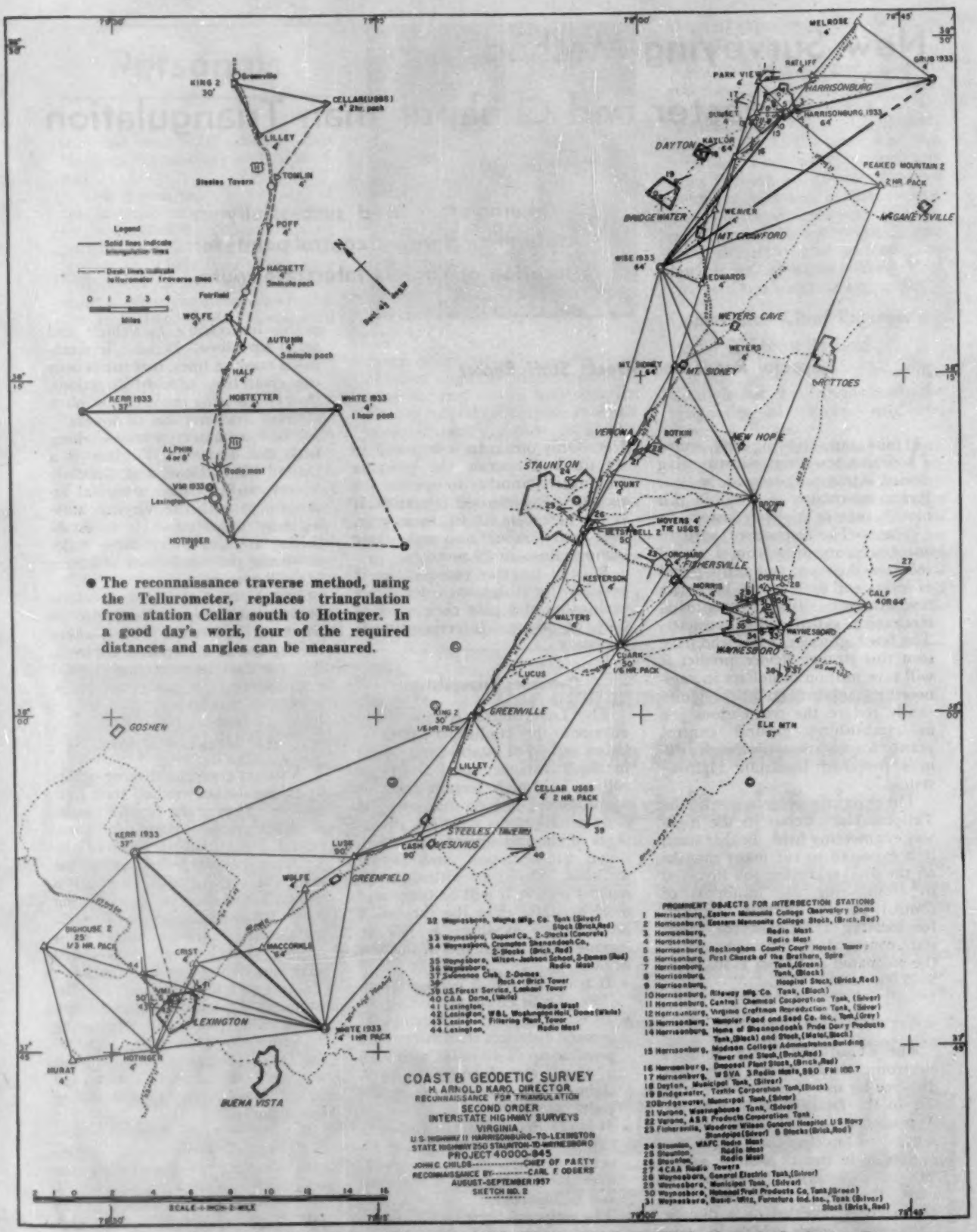
A survey crew establishing points by triangulation method took four months to cover the first 120 miles of the Virginia assignment. Lieutenant Hal Demuth, chief of the Tellurometer party, estimates that his crew will be able to cover a similar distance in 20 working days. Reconnaissance crews, working ahead to pick out line-of-sight points and set ground markers, will have to move fast to keep ahead.

George Habel, the highway department's ground control coordinator, told *Roads and Streets* the department is considering purchasing a Tellurometer to establish some of the many points needed for their modern state mapping operation.

• • •

Roads and Streets was given permission to see the Tellurometer in action on this first practical application of the device to the highway job. The crew's typical morning's operations were revealing.

(Continued on page 89)



● **The reconnaissance traverse method, using the Tellurometer, replaces triangulation from station Cellar south to Hotinger. In a good day's work, four of the required distances and angles can be measured.**

● **Reconnaissance sketch for triangulation along U.S. Highway 11 from Harrisonburg to Lexington, Va.**

BPR Recommends Tellurometer for Long Base Line Work

In a memo to its regional and division engineers, the Bureau of Public Roads estimated "conservatively" that "control surveys made with the Tellurometer will cost about 60 percent of the cost of conventional triangulation or traverse surveys." The bureau also pointed out that the device should prove invaluable in making surveys for long bridges, especially where room for long base lines is not available.

"A good place to utilize Tellurometer surveys would be on the establishment of geodetic markers which would be used for highway control surveys. This work is authorized under Section 119 of the Federal-Aid Highway Act of 1956, and the procedure is set forth in PPM 20-9. The geodetic markers provide accurate control of surveys and relieve the highway engineers of many details. The Coast and Geodetic Survey will assume the responsibiilty for the accuracy of the surveys and will make or supervise the necessary computations. In fact, to the limit of their abilities they will make the surveys with their own forces.

"The cost of such surveys is comparable in cost to the cost of the necessary basic control needed for photogrammetric surveys. It is desirable from the standpoint of accuracy and economic efficiency to have vertical and horizontal survey control points established prior to making ground surveys and preliminary mapping by photogrammetric methods for highway purposes.

"State highway departments planing to conduct extensive control surveys either under Section 119 of the Federal-Aid Highway Act of 1956, or as a part of their regular engineering procedure, should give serious consideration to the utilization of this equipment. We strongly recommend adequate, accurate control surveys, especially when photogrammetric methods are used to compile topographic data to be used in the design and construction of high-type highway facilities. Such controls will save money and time over an extended period.

"One set of equipment consisting of one master station, two slave stations, and the necessary spare parts and accessories cost about $15,000. It is felt that savings in personnel costs, and from having accurate data available at an earlier date would soon equal the purchase cost of the equipment."

NEW SURVEYING METHOD

(Continued from page 87)

We found the outfit working a traverse line down the proposed route for Virginia's new U. S. 11, an Interstate system highway which will run down the Shenandoah valley, just west of the Blue Ridge mountains. The Virginia state highway department has requested that new stations be established about every three miles along this line.

Lt. Hal Demuth, 33-year-old party chief who is directing the operation, was the only man who had any previous experience with the device. The other three men—Ensign M. J. Rothenberg, G. R. Heid, and Carl Stover—were trained on the job, an indication of the simplicity of the instrument.

At 9:30 a.m., after discussing the day's work and loading the gear into two carry-alls, the party left the base and headed for their agreed-upon stations. Rothenberg, with a remote unit headed for a designated point in one vehicle. Demuth, Stover, and Heid started off in the second truck. Demuth and Stover got out at an intermediate point with the transmitter, and Heid went on to another point with a second unit. Although it is possible and practicable for two men to operate the system, Demuth had found that he can sometimes keep two units busy by setting up at every third station and measuring the distance to both the station ahead and the station behind in the one set-up.

It took about 40 minutes for the men to reach their stations, by vehicle and on foot. Fortunately, on this day, stations were within a short distance of the existing highway. Stover, who accompanied Demuth on this occasion, helped carry the equipment and acted as recorder. All were following directions which a reconnaissance crew had written when they had located the points several days previously.

While Demuth unpacked and mounted his Tellurometer on a common tripod, the pair of units were doing likewise. This took about 12 minutes. After a 3-minute wait, Demuth picked up the two-way radio phone with which the tellurometer comes equipped and made contact with Rothenberg. Time: 10:24.

Sweeping his instrument around the horizon in the general direction of Rothenberg's position, Demuth located him exactly by noting where the strongest impulse registered on the instrument panel. Exchanging directions over the radiophone briefly expedited this procedure even faster.

"Actually, we don't need to pinpoint each other's position," Demuth said. "The machine takes accurate readings if it's within 10 degrees or so of the correct line. That's the beauty of it in foggy weather when we couldn't see each other at all."

Having obtained correct position, Demuth was ready to start taking readings. This was done by observing a floating green circle on an oscilloscope, a circular dial divided radially into lines numbered from zero to 100. The circle broke at one point, indicating the number of millimicroseconds it was taking the microwaves to travel from the master to the remote and back. Demuth read these numbers off as he flipped switches from crystal to crystal. First, a series of coarse readings on one frequency, equivalent to reversing a theodolite. Stover took them down as fast as the operator called them off.

"78 . . . 86 . . . 63 . . ."

At the other end with the remote, Rothenberg was adjusting his instrument to settings Demuth indicated over the radio-phone.

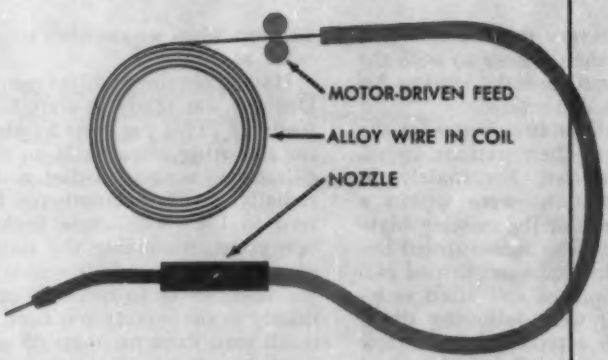
Next, Demuth took a series of fine readings on 12 different frequencies to assure accuracy. The Tellurometer can transmit over 20 different frequencies, although its makers claim that accuracy can be obtained by taking the mean of readings obtained over three or four. This crew was trying to avoid any possibility of error.

By 10:34—or only 15 minutes after establishing contact with Rothenberg—Demuth had all his readings, all the data needed for ascertaining the correct distance.

(Continued on page 101)

WHAT IS *SEMI-AUTOMATIC* HARD-FACING?

Here is one of industry's newest maintenance tools used to radically reduce hard-facing costs. It is simple, highly versatile and can be installed at moderate price.



Semi-automatic hard-facing is a process which combines the high deposit rates of automatic welding with the positioning and setup convenience of the manual method. It utilizes a complete series of Stoody fabricated tubular wires containing alloys that meet all hard-facing requirements. These wires, supplied in layer wound coils, are mechanically fed to the nozzle by the semi-automatic welding machine. The weldor merely directs the arc as the metal is deposited on the work, the machine automatically starting the wire feed when the arc is struck, stopping it when the arc is broken. Numerous advantages result when rebuilding and maintaining equipment in all types of heavy industry.

Repointer welded on with Stoody Nickel Manganese and entire tooth hard-faced with Stoody 121

Roll brought up to size with Stoody Nickel Manganese and corrugations rebuilt with Stoody 100

HIGH WELDING SPEEDS—Two to four times faster than the manual method at correct welding amperages, semi-automatic hard-facing effects enormous savings in time. Penetration of the base metal and dilution of the deposit are reduced, with lower heat input, all highly desirable features of this process.

FULL VISIBILITY—No submerging flux is required; the weldor enjoys complete visibility of the weld at all times. Flux dams are unnecessary.

NO STUB END LOSSES—Wires are supplied in continuous coils. There is no stub end waste nor time lost in changing electrodes.

SEMI-AUTOMATIC MACHINES—Now supplied by a number of manufacturers, all can be used satisfactorily with Stoody semi-automatic wires with minor conversions consisting of wire guides, nozzle and nozzle tip. Conversion kits are available from all Stoody distributors.

WHERE CAN SEMI-AUTOMATIC HARD-FACING BE ECONOMICALLY USED?—In general, almost any work now hard-faced manually can be completed faster and cheaper semi-automatically with deposits having wear resistance usually superior to manual electrodes of similar analysis. The illustrations are typical of current semi-automatic applications.

Write for circular. Contains a full description of present Stoody semi-automatic wires and typical applications.
Available from your Stoody dealer.
Check the "Yellow Pages" of your phone book or write direct.

Shovel track pads rebuilt with Stoody Nickel Manganese

Mill hammers brought up to size with Stoody Nickel Manganese, using copper form, then hard-faced with Stoody 100

Tool joints hard-faced with Stoody 130 or Stoody 100

Dredge pump casing hard-faced with a combination of Stoody 121 and Stoody 100

STOODY COMPANY
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WHITTIER, CALIFORNIA

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Here's the torque converter equipped HD-16 on the job at Tyrone Rock Quarry, located south of Atlanta, Georgia. The torque converter was the reason this firm picked the HD-16.

"Why did we buy the HD-16? Because of *torque converter drive!*"

says Pete Bradberry, Tyrone Rock Products Company

When Tyrone Rock Quarry needed a new track-type tractor, company officials made no bones about one feature the machine had to have—namely, a torque converter drive.

As Superintendent T. J. (Pete) Bradberry describes it: "We bought the Allis-Chalmers HD-16 because of the *torque converter drive*. We find the torque converter automatically matches speed and pull to load requirements and terrain conditions. Under full throttle, the engine doesn't lug down, but instead delivers maximum horsepower at all times. It saves wear and tear and is worth many times the price!"

Torque converter drives prove ideal for such applications as rock quarry work . . . for stripping overburden, stockpiling and maintaining roads. They speed work and save operating costs. They permit engines to operate in their most efficient speed range at all times . . . They match power automatically to load demands . . . providing up to 6:1 torque multiplication when required. Heavy load pick-up is smooth and even, without clutch slippage . . . for better over-all flotation.

Allis-Chalmers offers a torque converter as optional on the HD-16 Tractor and as standard equipment on the bigger HD-21. In either case, the converter components are furnished by Twin-Disc—your assurance of dependability.

All three of the leading track-type tractor manufacturers offer torque converter drives as optional or standard in certain models . . . and all three standardize on Twin Disc components. Be sure to specify a torque converter in your next machine. See for yourself how they cut costs, bring in new profits.

Twin Disc Clutch Company, Racine, Wisconsin; Hydraulic Division, Rockford, Illinois.

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois

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● Some of the deepest snow canyons of any mountain pass are required to keep traffic going in western Montana.

Deep Snow, Bad Slides... Notes on

One of West's Toughest Snow Fighting Jobs

Two kinds of slides—both bad actors—are encountered in the heavy snow belt on U.S. 2 west of the Continental Divide. Dozers, rotaries and blades each have their assigned duties when a road block occurs.

By Fred Wells

Division Maintenance Engineer,
Montana State Highway Commission, Kalispell

IN WESTERN MONTANA the highways are snow and ice covered from the first of November until April. Snowfall averages about 400 in. with a prevailing roadside snow depth of 5 to 7 feet.

Road elevation in our slide area is about 4,000 ft., with mountains rising above the highway to 7,500 ft. Slopes range from 40 to 70 percent and carry very little vegetation. Many conditions contribute to our slides. Strong winds, heavy snowfall and barren slopes are the main factors. A slide can occur at any time after December first, when roadside snow reaches a 2 ft. depth.

The most hazardous area is a 4-mile section that runs parallel with the Great Northern Railroad along Bear Creek. The railroad is built well up on the mountain slope and is protected with snow sheds, whereas the highway parallels the creek up a narrow valley where it may be blocked from both slopes by slides.

There are two distinct types of snow slides. The most dangerous of these is caused by a heavy snowfall on crusted snow at temperatures of 0° to 20°, with the base snow exceeding 4 ft. depth and the new snow exceeding 18 in. in a 24-hour period. Great areas of the snow start to slide, and as the slide builds up volume and momentum it gets out of the regular channels, picking up trees and debris from the slopes. These slides can be 1,500 ft. wide when they cross the highway. They occur usually between January 15 and March 1. The snow under these conditions will continue to move for several days, and slides occur any time of the day or night, making travel and working conditions very hazardous.

The other type of slide results from heavy deposits of snow built into cornices by strong winds over the lee side of the mountains. These slides occur in the latter part of March or April and are usually caused by heavy rains and warm weather. They generally stay in given channels, travel slower than the dry snow slides, and are greater in depth but not nearly as wide. They usually start in the late afternoon or early evening and will continue over a 48-hour period.

Four men are stationed at Summit near the east end of the slide area. Here during the 1956-57 winter we had two 3-ton Ford dump trucks with one-way plows, one 7-ton FWD with "V" plow and wing, one 7-ton FWD with rotary Sno-Go, one motor grader and one International tractor with dozer. This outfit worked the highway from Essex to East Glacier, a distance of 30 miles, which includes the slide

● A snow slide being cleared from the road ledge. This snow is clean, but nevertheless required heavy equipment. Photo below shows rotary eating its way through a widening pass.

● Another slide. This one is composed of ice and debris as well as snow, and took many hours of dozing to clear.

area. The same type of outfit is on duty this winter. When snow slides occur our regular crew is assisted by a four-man crew located at Nyack, which is 20 miles west of the slide area. This crew has equipment similar to that of the Summit crew.

A snow slide is usually opened up with a heavy dozer in about the same method as pioneering a side-hill cut. The dozer then pushes to a Sno-Go at road elevation, sorting out logs and debris and loosening snow. The sides of the slide are left vertical, as there is no danger of them sloughing in. The dozer and Sno-Go will move about 500 cu. yd. of packed snow per hour on an average slide.

The crew work only daylight hours and on days that visibility is good enough to see the top of the mountains. A watchman is stationed on the slide above the crew. If he sees any snow movement he warns the crew and they leave the area immediately. As the slides move at about 60 miles an hour, the crew has from 30 to 60 seconds to leave the danger area. No attempt is made to move the equipment.

On days when the crews cannot work the slides, they are busy plowing other portions of the roadway with the "V" and one-way plows.

We have had many close calls and buried equipment several times, but fortunately no fatalities in past winters from snow slides on this section of U.S. No. 2.

Skid Testing Machine Is Developed by General Motors

To help highway engineers measure "skidability" of road surfaces, General Motors Proving Grounds staff has developed a simple, inexpensive "skid trailer" for use on any type of pavement.

Formally known as a "road coefficient of friction trailer," the device is an assembly of truck and auto parts from any parts department or junkyard. Assistant proving ground director Kenneth A. Stonex and experimental engineer Paul C. Skeels designed the unit from salvage materials so any highway department could duplicate and operate it at low cost. Already the Michigan state highway department has built a duplicate unit and other highway agencies have inquired about it. In fact, in two weeks of operating over rural and city pavements in an eastern state, the trailer made 4,000 tests.

Meetings

AMERICAN ROAD BUILDERS' ASSOCIATION—Annual Convention, Sheraton-Park Hotel, Washington, D.C.; January 20-23, 1958.

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION—Sixth Annual Meeting, San Marcos Hotel, Chandler, Ariz.; January 20-24, 1958.

ASSOCIATED EQUIPMENT DISTRIBUTORS—39th Annual Meeting, Conrad Hilton Hotel, Chicago, Ill.; January 26-30, 1958.

NATIONAL BITUMINOUS CONCRETE ASSOCIATION—Annual Meeting, Hotels Sands, Sahara and Flamingo, Las Vegas, Nev.; February 4-6, 1958.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA—Annual Convention, Statler Hotel, Dallas, Texas; February 9-13, 1958.

NATIONAL SAND AND GRAVEL ASSOCIATION—Annual Convention and Exposition, Conrad Hilton Hotel and Chicago Coliseum, Chicago, Ill.; Feb. 10-13.

NATIONAL READY MIXED CONCRETE ASSOCIATION—28th Annual Convention, Conrad Hilton Hotel and Coliseum, Chicago, Ill.; Feb. 10-13.

ASSOCIATION OF ASPHALT PAVING TECHNOLOGISTS—Annual Meeting, Sheraton Mt. Royal Hotel, Montreal, Quebec; February 17-19.

AMERICAN CONCRETE INSTITUTE—Annual Convention, Morrison Hotel, Chicago, Ill.; Feb. 24-27.

AMERICAN SOCIETY OF CIVIL ENGINEERS—Winter Convention, Chicago, Ill.; February 26-28.

READY MIXED CONCRETE ASSOCIATION OF WISCONSIN—Annual Convention, Plankinton Hotel, Milwaukee, Wis.; March 10-12.

NEW YORK STATE ASSOCIATION OF HIGHWAY ENGINEERS—Annual Meeting, Manger Hotel, Rochester, New York; March 26-28.

New Guard Rail Standard Adopted in Virginia

Notice from the Virginia department of highways notes the adoption of a new standard for highway guard rail. The present specifications require 10 gauge metal and a minimum tensile strength of 70,000 lb. The new standards require 80,000 lb. tensile strength but permit the use of twelve gauge metal with which this strength can be obtained. This applies to Type A steel beam guard rail as called for in Section 240 of the current specifications.

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Whether it is breaking up huge sections of road or airport runways—or making a service cut in asphalt, you can depend on ARROW MOBILE HYDRAULIC HAMMERS to do the job better and at lower cost. Contractors, public utility firms, cities and counties, across the country and outside are finding the ARROW a real money-making, money-saving machine. Get *all* the facts—then you'll get an ARROW.

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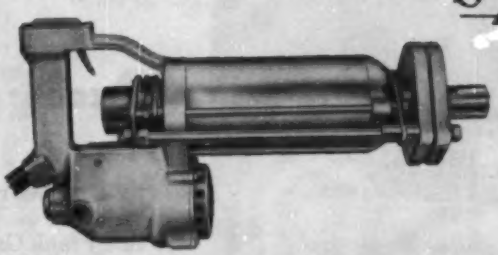

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SYNTRON Quality Built Electric Hammer Drills give long, dependable service on job after job with little maintenance.

Available in size to meet every drilling need. Capacities from 5/8" to 2" diameter holes.

Builders of quality equipment for more than a Quarter-Century.

Write to **SYNTRON COMPANY** 384 Lexington Ave. Homer City, Penna.

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ON THE CONNECTICUT TURNPIKE

No place for trucks you have to "baby"! Gammino's Macks are hauling close to *seven million* yards of rock and earth as the Connecticut Turnpike is rushed to completion. That means those mighty shovels are really moving as they drop the heavy, jarring loads of rock into the trucks beneath. It also means that Gammino's Macks are taking tremendous punishment, both from the hustling shovels and from the makeshift roadbeds over which they operate in an endless loading-dumping cycle.

"Sure, it's backbreaking work for any other truck," says Mr. Gammino. "That's why we use Macks."

No job's too tough for Gammino, because... THEY

Want the real pitch on Mack can-do?

Ask Frank Gammino of M. A. Gammino Construction Company, Providence, Rhode Island. He'll talk Macks with you all afternoon.

Ask him about the small but important jobs, where Mack economy enables him to deliver at a profit.

Ask him about the big jobs, where the power and schedule-meeting dependability of his Macks pace the entire operation.

And ask him about the really rugged jobs—the chassis-jolting rock-loading jobs . . . the up-to-the-hubs-in-mud jobs . . . the jobs where his Macks work round the clock, rushing out big-yardage loads for weeks on end without a break or a breakdown.

Then ask him why he has still *more* Macks on order. We'll stand on that. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

YEAR AFTER YEAR IN THE U.S.A., MACK DIESEL TRUCKS OUTSELL ALL OTHERS

ON THE PROVIDENCE RIVER BRIDGE JOB

Gammino's Macks are keeping big buckets busy. Concrete, not excuses, is what this job calls for—any late deliveries mean expensive, profit-robbing delays. "With Macks on the job," says Mr. Gammino, "no one sits on his hands."

DEPEND ON MACKS

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ON OVER-THE-ROAD HAULING OF CRUSHED STONE AND DIRT

. . . a wise contractor keeps a close eye on running costs—fuel, maintenance, down time, tire wear, etc. Mr. Gammino does just that, and he reports: "Nothing touches a Mack for ton-mile economy."

MACK
first name for
TRUCKS

5297

Soil-cement construction train: Tractor pushing tamping roller; one-pass mixer; water truck. In the distance is the cement spreader.

1 *Compacting with tamping roller*

2 *Blading compacted soil-cement mix*

3 *Finishing with pneumatic rollers*

4 *The completed, all-weather road*

Genesee County, Mich. proves value of all-weather *SOIL-CEMENT* roads

The tremendous population and traffic growth in Genesee County, Mich., severely taxed the capacity of the gravel-surfaced county road system. Rapid conversion to the most serviceable, economical type of all-weather road was essential.

The Road Commission of Genesee County investigated the problem and decided to try soil-cement. Two 1-mile test sections of soil-cement road* were built in 1951. These wintered well and five miles were built in 1952. In 1954, 4.9 miles were added. And in 1955 an additional 5.4 miles were built.

By 1956 the Road Commission decided that soil-cement all-weather roads had definitely proved themselves and felt justified in adopting a much larger program for that year. Accordingly 33 miles, involving 405,000 sq. yd., were built.

These soil-cement roads have met with wide public approval and a growing demand for increased construction. As a result, at least 60 miles are planned for the 1957 construction season.

As in Genesee County, officials everywhere are specifying soil-cement for modernizing old roads. Soil-cement is also being used extensively for paving shoulders and building new roads.

For more information on this fast and economical method of paving write for free literature. It is distributed only in U.S. and Canada.

*Consists of soil-cement base and bituminous surface.

PORTLAND CEMENT ASSOCIATION
Dept. A12-28, 33 West Grand Avenue, Chicago 10, Illinois
A national organization to improve and extend the uses of portland cement and concrete . . . through scientific research and engineering field work

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CONTRACTOR MANAGEMENT

Helicopter and Calculators

● Rarely a daytime visitor to any of his several offices and plants throughout the central Connecticut area, Frank D'Addario often spends evenings at his Bridgeport headquarters—and his workday hours in the field.

Help Manage These Six Companies

For figure work as well as field work, F. Francis D'Addario, of Bridgeport, Conn., is a contractor who believes in the best mechanical equipment. With the outlook for expanding road construction he feels that contractors will have to "live modern" in the office and in engineering and supervisory work.

To help in the management of his six Connecticut companies in excavating, roadbuilding, and the contracting supplies fields, Francis D'Addario recently added two new units to his equipment.

To step up the inspection and supervisory phase of D'Addario company activities he has a new 4-place helicopter. And to step up the flow of figures for engineering, estimating, cost control, payroll and general accounting there is the latest in automatic calculating machines.

The helicopter is definitely an innovation, but up-to-date office equipment for engineers, estimators, accounting and bookkeeping personnel is not new with the D'Addario companies. Sometime before the payrolls hit the 200 mark (peak now near 300), the offices in Bridgeport were equipped with modern Monroe calculating machines. Payroll figuring—straight time, overtime, withholding taxes, Social Security, and other deductions—was reduced from a matter of a couple of days of laborious figuring and transcribing to a little over an hour of machine calculating time.

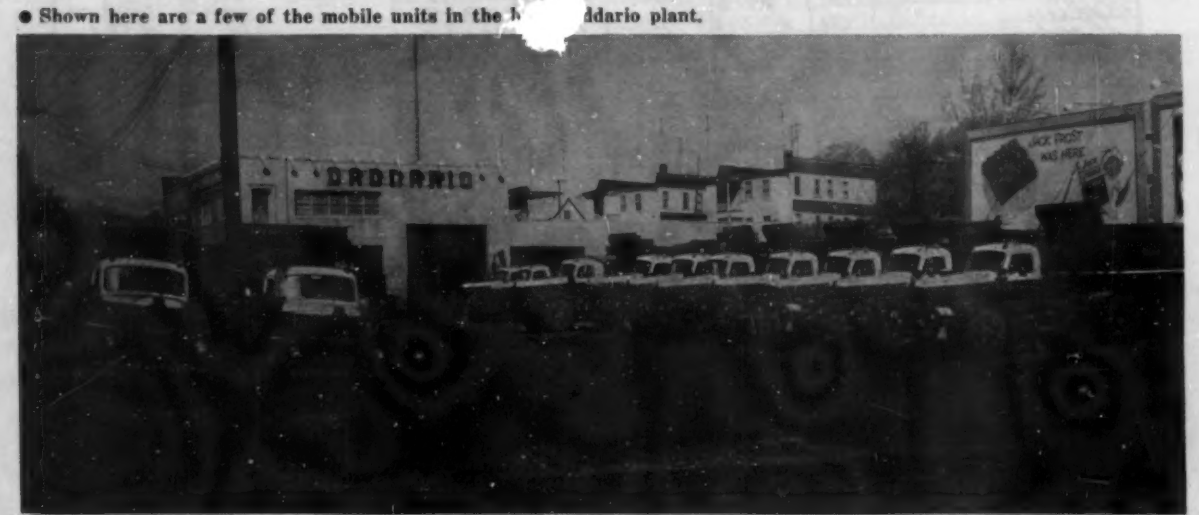
Miss Joan D'Addario, secretary of the several companies with operations centered in the main Bridgeport office, believes that the automatic calculator is the most important piece of behind-the-scenes equipment in the contracting business.

● *Quantity Estimates.* The advantages of figuring engineering problems and estimates by Monroe machine rather than slide rule or pencil and paper are fully accepted in the D'Addario offices. "In all work on cuts and fills there is always the problem of figuring volume," according to Charlie Hermann, engineer in charge of construction. "Our staff has cut estimating time tremendously, and even our human errors have been reduced to a minimum by our making use of the three-factor feature on the automatic calculator."

"We first multiply the length by the width and, by use of the transfer mechanism which operates at the touch of a button, we then multiply this result by the depth. This operation is performed without copying the first result from the dials, so the possibility of making transposition errors is completely eliminated. At this point we divide by 27 and an accurate cubic yardage content is figured."

The calculators have wide application to cost accounting on equipment and general accounting. And in the sand, gravel, dynamite, ready-mix concrete and asphalt, and other construction supply phases of the business, the calculator is reportedly a big time saver in extending invoices, figuring sales taxes, checking accounts payable and other items.

● Shown here are a few of the mobile units in the [illegible]ddario plant.



● Alexander Lynch, asphalt division foreman and Miss Joan D'Addario, secretary of the D'Addario companies, checking a payroll.

● Chief engineer Charles Herman and engineer-estimator Alexander Lynch.

● *Payroll figure problems.* Graphic evidence of the value of an automatic machine is found in their experiences in payroll figuring. To the normal complexity of figuring all the time, taxes and other withholdings for a large and fairly scattered group of employees in the general contracting operations, the Connecticut firm adds at its main office the handling of payrolls for the affiliated D'Addario sand and gravel companies in Newton and Oxford, Conn., and for D'Addario Explosives Company (for the sale of dynamite).

In peak periods and before doing the calculating on the automatics, the task often took most of two or three days. Now, in peak periods, the figuring seldom takes more than 1½ hours, including double check.

Similar simplification has taken place in handling paper work for the group's two other companies, D'Addario Asphalt and Paving Co. and Bridgeport Concrete and Asphalt Co.

Sometimes there is more to payroll figuring than just getting the right answer. A case in point, the company has found that by taking just a little extra trouble—to accurately figure withholdings, instead of taking approximations from pre-printed charts—they have a happier group of workers.

Miss Joan D'Addario figures the withholding taxes to the penny. The decision to do so is explained this way:

"We always compute the withholding tax and F.I.C.A. deductions on a calculator. Formerly, we used a chart for this purpose but found at the end of the year that chart deductions and the actual tax varied, to the extent, that we received numerous complaints from our employees because extra money was due for income tax. A little thing like that can do a lot of harm to our employee relations.

"The withholding tax amount for a weekly pay, for example, of $119.60 may actually figure to $21.53 per week. According to one chart the amount to be withheld on that amount of pay is $21.20. This meant not enough had been withheld; 33 cents a week to be exact. That doesn't sound like much, but come April 15 and that employee will owe the government $17.16 in taxes—and we will have been at fault in the employee's opinion."

In using Monroe automatic calculators on the straight and overtime pay figuring, the D'Addario payroll department has worked out a simplified procedure. Miss D'Addario describes it this way.

"All overtime is computed at time and one-half, so we multiply

(Continued on page 113)

D'ADDARIO CONSTRUCTION CO.
513 BOSTON AVE. BRIDGEPORT, CONN. Date April 16, 1957

DAILY WORKING SCHEDULE

Tractors and Trailers

DRIVER	NAME OF TRACTOR	NO.	REG.	NAME OF TRAILER	NO.	REG.	TIME OUT	ASSIGNMENT	TIME IN	NO. LOADS
Hoffman	M	32	X 2965	F	103	T 4712	7:30	Section 32	5:02	14
Sparks	"	12	X 2985	"	116	T 4763	7:22	" "	5:02	14
D'Acuto	"	18	X 2916	T	87	T 4691	7:37	" "	4:58	14
Jolliff	"	6	X 2934	F	55	T 4753	7:39	" "	5:00	13
Brodof	"	38	X 2918	"	15	T 4708	7:41	" 07	5:14	9
Smith, E.	"	11	X 2903	"	26	T 4698	7:45	" "	5:30	9
Beaney	"	62	X 2991	T	101	T 4734	7:45	" "	5:06	9
Gaudusto	"	14	X 2912	"	63	T 4722	7:45	Route 44	5:09	17
Hanson	"	43	X 2984	"	44	T 4688	7:46	" "	4:55	17
Chilmark	"	19	X 2909	F	20	T 4700	7:46	" "	5:14	17
Strasser	"	8	X 2937	T	9	T 4750	7:46	Section 18	5:02	12
Furchak	"	27	X 2946	T	96	T 4719	7:48	" "	5:06	12
Clegg	"	13	X 2971	F	63	T 4727	7:45	" "	5:00	12
Di Addazo	"	56	X 2911	F	9	T 4692	7:48	" "	5:13	11

● A typical work schedule sheet from which D'Addario's staff calculate costs and check job expenses against estimates.

• Unloading gear.

• Assembling receiver at station.

• Receiver operator on radio phone taking instructions.

Step-By-Step With the Tellurometer

With U.S. Coast and Geodetic Survey crew which is applying the new Tellurometer for the first time to highway work. Here, their crew is measuring distance between points established about three miles apart down the proposed route of a new Interstate System highway in Virginia.

1. 10:10 a.m.; The two-man party has come as close to the station as possible. Both units of the Tellurometer are compact and portable by one man, although in this case one crew member joined the operator as assistant and recorder.

2. After finding the ground control marker set in place earlier by the reconnaisance crew, the operator of the remote unit sets up his tripod and mounts his unit.

3. 10:20 . . . Ready for action, the operator swings his transmitter toward one remote unit, somewhere to the north, approximately three miles away. It is possible to pinpoint the receiver very closely by instruments on the device, but this is not necessary. The Tellurometer is accurate even if only approximately in line.

4. Establishing radio phone contact with the remote can be immediate. In this case, the operator who was setting up his receiver simultaneously at the other station took a couple of minutes longer.

• Taking readings at various frequencies at transmitter.

• Obtaining barometer and temperature readings.

5. Assembling the remote unit is exactly the same as setting up the transmitter. Here the operator mounts his receiver and attaches the reflector which surrounds its antenna.

6. The receiver operator's major job is to set up his unit and then, following instructions over the radio phone, flip switches from frequency to frequency so the transmitter can obtain readings at various wave lengths.

7. Taking the readings off his oscilloscope, the transmitter operator calls them off to an assistant acting as recorder. One man can do both jobs.

8. At both stations, temperature and barometric readings are noted. They will later be used as factors in translating the speed of the radar waves between the two points into linear measure.

9. 10:34 . . . Finished . . . The transmitter operator has all the readings he needs to determine the distance between these two points and he swings his device around to contact a second remote in the opposite direction.

NEW SURVEYING METHOD

(Continued from page 89)

At both the beginning and the end of the observations, he noted the temperature and humidity (using a psychrometer), and barometric reading. Rothenberg took the same data at his station also and relayed them over the radiophone to the recorder. Back at the base, simple adjustments would be made with these factors to compensate for their effect on the propagation of the waves.

Demuth gave Rothenberg instructions for moving down the valley to another station. Then swinging the master unit around in the opposite direction, he picked up Heid's position and the procedure was repeated. Radio contact was almost immediate this time, and the readings were again taken in 10 minutes. Disassembly took another ten minutes, and by 11:04 they were ready to move on down the line.

It would take one man about two hours to make all the necessary computations involved in a day's work (measuring between four or five stations) correcting for slope and reducing to sea level.

Later another crew would come through with a theodolite and turn the angles, although that could have been done at the same time.

J. C. Lavender, project superintendent for Craggs Construction Company.

"OUR ALLIS-CHALMERS

Forty Five motor grader puts finishing grade on roadbed. Notice how the ROLL-AWAY moldboard keeps load live and rolling.

Big, powerful HD-21's clear right-of-way and level fill. Torque converter drive makes big production easy for operator . . . easy on tractor and equipment.

FLEET HELPS US BID LOW

...finish the work on schedule"

. . . that's what J. C. Lavender, superintendent for the Craggs Construction Company, Ocala and Gainesville, Florida, says about his company's Allis-Chalmers fleet.

Craggs Construction Company was awarded a 14½-mile job on Florida State Route 207, an important farm-to-market road in the heart of the potato growing area. The contract called for widening, filling, straightening out several sharp curves, and constructing a large number of drainage ditches.

Here are the Allis-Chalmers machines that did the bulk of the work: 4 motor scrapers, 4 motor wagons, 13 crawler tractors, 4 pull-type scrapers, 5 motor graders.

This Allis-Chalmers fleet moved approximately ½ million cubic yards of material from 5 borrow pits for filling and stabilizing. Almost 200 acres of land were cleared and grubbed by bulldozers as the right-of-way was widened to accommodate a 24-foot pavement with 8-foot shoulders.

Whenever you have to move dirt in a hurry — on large jobs or small — investigate the many reasons for going Allis-Chalmers. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Engineering in Action

ROLL-AWAY is an Allis-Chalmers trademark.

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Forward forced ejection and high apron opening provide fast, clean, unobstructed dump and smooth, controlled spread. This keeps fill area in good operating condition . . . contributes to better compaction.

Curved cutting edge and offset center bit of Allis-Chalmers motor scrapers mean no corner voids . . . a full payload every trip.

"2-way radio is our best and lowest cost maintenance-construction tool"

SAYS NORTH H. NEWTON, CHAMPAIGN COUNTY ENGINEER, URBANA, OHIO

Foreman, miles away, gets question answered in minutes, not hours.

Radio operator Lewis Metherd checks location of sudden snowfall, prepares to shift crews.

Radio-equipped foreman checks garage in seconds about needed repairs.

"Fast and quick communication is just as essential to any highway department as it is to a military commander. And, for the past 2 years, Motorola 2-way radio has given us just that—multiplying our efficiency and productivity every day of the year.

"With all crews and foremen in constant touch with each other and the dispatcher in our office, information can be passed along in minutes, no matter where they are. Hours, even days, can be saved in meeting emergencies, and everyday work is handled with no lost motion and no waste time. Costly crews and equipment are shifted from job to job while still in the field. Snow removal, bridge repair, washed out roads, black topping, equipment breakdowns—all are taken care of faster with the help of our Motorola radios. And better service means better public relations too, a valuable asset anytime.

"I could fill a book with stories on how radio has saved us time and money. It's the most inexpensive piece of equipment you'll ever buy . . . so low you can't afford to be without it. The closer knit organization you'll have will give you better control over *all* your operations, and actually *save* you money at the same time."

What stronger recommendation for 2-way radio can there be? Investigate, and find out how *Motorola* 2-way radio can help you do the job better and at a lower cost.

MOTOROLA

2-WAY RADIO

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC.
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4501 AUGUSTA BOULEVARD • CHICAGO 51, ILLINOIS

Motorola consistently supplies more mobile and portable radio than all others combined.
Proof of acceptance, experience and quality.
The only COMPLETE radio communications service—specialized engineering...product...customer service...parts...installation...maintenance...finance...lease.
"The best costs you less—specify Motorola."

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366	367	368	369	370	371	372	373	374	375		359	360	361	362	363	364	365

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Firm or Gov't. Dept._____

Street_____

City_____ State_____ 12-57

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About New Equipment and Literature:

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Name_____ Title_____

Firm or Gov't. Dept._____

Street_____

City_____ State_____ 12-57

NOT GOOD AFTER JANUARY 15, 1958

New Products

Reader Service Numbers Are on Enclosed Postage-Paid Postal Card

Side Shift for Lift Truck

Yale Materials Handling Division, Yale and Towne Mfg. Co., Philadelphia, Pa., has introduced a swing shift side shift attachment for its new line of gasoline powered industrial lift trucks in capacities of 15,000 to 20,000 lb. It is claimed to provide for faster handling of heavy loads by large, high capacity trucks.

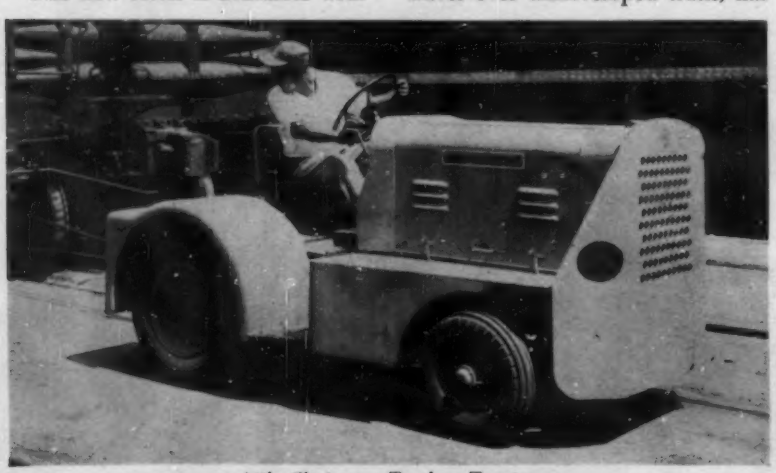
By allowing the fork carriage to be shifted to either side of center and rotated on an axis in either direction, this attachment makes the truck more maneuverable. Both actions are achieved hydraulically. The attachment can shift the truck forks and load 6 in. to either side of center. The swing shift characteristic permits slewing forks and load to travel in a 10 deg. arc in either direction.

For more details circle 101 on Enclosed Return Postal Card.

Towing Tractors

Two new industrial towing tractors, Models TG-45 and TG-50, have been added to the material handling equipment line of Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Both models provide lower profile and the compactness necessary for use in areas where overhead clearance is often limited.

The new series is available with Allis-Chalmers gasoline, diesel or LP gas engines that develop 74 brake hp and 170 ft. lb. torque at 1200 rpm. They give the units a pulling capacity of 90 to 100 tons on level surfaces. The tractors have an overall length of 101 in., are 57½ in. high, 66 in. wide, and have an under clearance at center of 9 in.



Allis-Chalmers Towing Tractor

For more details circle 102 on Enclosed Return Postal Card.

Mammoth Log Hauler

A new log hauler, designed for travel over undeveloped trails, has just been introduced in the U.S. by R. G. LeTourneau, Inc., of Longview, Texas. Similar LeTourneau units have been proved in hauling 30-ton loads of mahogany over mud trails in the Philippines, it is stated.

The "Series T" transporter has DC electric motors geared directly to each wheel, electrically powered steering and a single electric control for speed, power and braking. Because of the direct-geared motors, the machine has no clutches, drive shafts or other mechanical drives. The use of wide-base, low pressure tires makes it unnecessary to use springs of any type between the bunks and axles.

Le Tourneau Log Hauler

For more details circle 103 on Enclosed Return Postal Card.

Self-propelled Roller

A 30-ton self-propelled rubber tired roller for asphalt, base and subgrade composition work has been announced by Bros Incorporated, Road Machinery Division, 1057 10th Ave., S.E., Minneapolis 14, Minn.

Called the SP-730, the roller has produced densities averaging from 101.5 to 103 percent on asphalt surfaces in one to two passes on controlled tests in Ohio, according to the company. On base aggregate compaction tests, the roller obtained 95 percent densities in two passes, it was claimed.

The SP-730 has three wheels in front and four in the rear, with full oscillation to provide even flow of compaction pressures. Rear wheel pairs have positive chain drive from power take-off. It is equipped with torque converter drive to provide smooth, even

Bros Rubber Tire Roller

transmission of power to the drive wheels. It is powered by a 95 hp diesel engine which develops 1800 rpm at operating speeds.

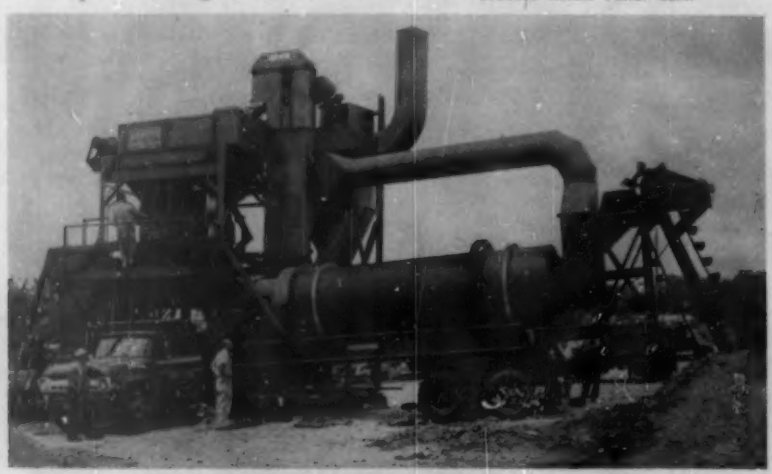
For more details circle 104 on Enclosed Return Postal Card.

Portable Asphalt Plant

Standard Steel Corp., 5001 S. Boyle Ave., Los Angeles 58, Calif., and Decatur, Ill., is now in full production on its TM 1-ton capacity trailer-mounted mobile mixer. This unit also is built in ½ ton and ¾ ton capacities.

Completely self-contained, this asphalt plant is especialy designed for on-the-job mixing in rural areas and hard-to-reach locations. It can be erected and made ready in a few hours. Special features include: the new Standard superlift dryer, built-in power erecting device which raises the entire mixing and gradation section from transport to operating position; oversize screens; heavy-duty jacketed mixer; positive weight control with aggregate weight hopper and asphalt bucket suspended on springless dial scales; and simplified push button controls to reduce operator fatigue.

For more details circle 105 on Enclosed Return Postal Card.

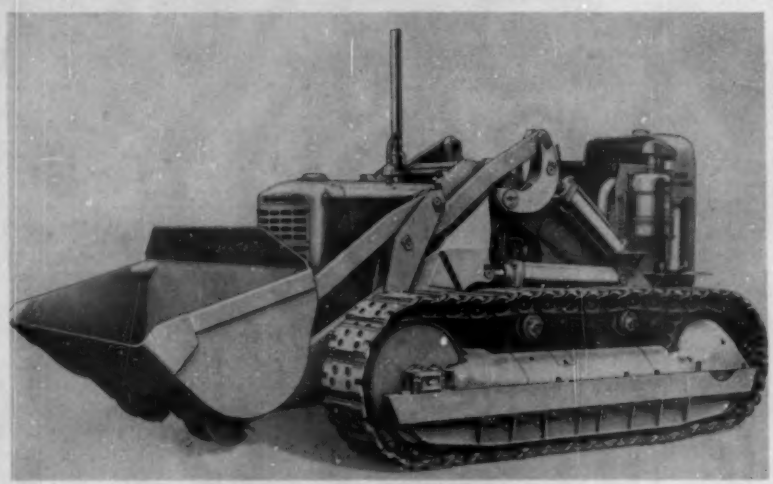


Standard TM Asphalt Plant

New Traxcavators

Two new Traxcavators, announced by Caterpillar Tractor Co., Peoria, Ill., are designed especially for use on such demanding jobs as quarry work and logging operations. They are the No. 955 and No. 977 (Series E) models, which have design modifications from corresponding Series C models intended to adequately match the rugged conditions.

Prime features of both machines are a strong undercarriage, with heavy construction incorporated into all undercarriage parts, track roller frames, sprockets, front idlers, track rollers and track carrier rollers. These features also allow for high ground clearance, along with a low center of gravity. Additional features of the No. 977 (Series E) include a 40-section track group with 18 in. flat shoes, and a special low-speed transmission.



Caterpillar Traxcavator No. 977

For more details circle 106 on Enclosed Return Postal Card.

New Screening Plant

Two new low-cost portable aggregate screening plants, designed for a high rate of production, have been announced by Pioneer Engineering Division of Poor & Co., Minneapolis 14, Minn.

Designated models No. 366 and No. 488, they consist of a single-desk buzzer screen and reciprocating plate feeder permanently mounted on a lattice frame conveyor installed on a hydraulic cradle truck. Model No. 366 is equipped with a 3 ft. x 6 ft. screen, while the screen on No. 488 is 4 ft. x 8 ft. Feeder and conveyor are matching. On both models, the

screen is pivot mounted on the delivery side of the conveyor, allowing it to be swung to operating position or to be folded under the conveyor for transport. Hydraulic raising and lowering of the conveyor are said to further simplify set-up and operation.

For more details circle 107 on Enclosed Return Postal Card.

Utility Tractor

A new tractor, the 330 Utility, has been added to International Harvester's tractor line. Delivering 35 hp at the belt, the tractor is stated to provide the strength and stability needed for fast, tough utility work. It has the built in strength and power capacity for handling heavy-duty backhoes, hoisting 4,000 lb. loads with a fork lift, or lifting 1,250 lb. loads with a front-mounted loader. Over 25 types of utility equipment are available.

Tractor features such as fast-hitch, torque-amplifier drive, hydra-touch hydraulics, power steering, and independent power take-off, are available at the buyer's option.

For more details circle 108 on Enclosed Return Postal Card.

International 330 Utility Tractor

Portable Bin Unit

Outstanding features of a new 6 cu. yd. portable bin unit, announced by Pioneering Engineering Div. of Poor & Co., Inc., are light weight and compactness, said to give it extreme portability with practically no set-up time required.

Designed to provide a quick-discharge, surge hopper for truck loading from portable crushing and screening plants, the new unit can be increased to 8 and 10 yd. bin capacities by the addition of bin extensions. Each unit consists of a 7 ft. 6 in. sq. steel bin and a 30 in. wide x 21 ft. long channel frame conveyor, mounted on a two axle truck frame with pneumatic tires. The delivery conveyor can be folded for ready transport and quickly swung back into operating position when loading resumes.

For more details circle 109 on Enclosed Return Postal Card.

Pioneer Screening Plant

Rotary Compressor

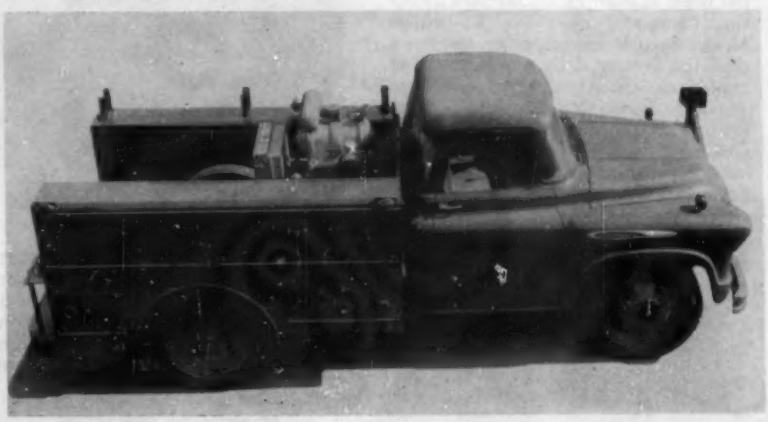
A 125 cfm "Auto-Air" (truck mounted) rotary compressor is announced by Davey Compressor Co., Kent, Ohio. Known as the Davey Hydrovane Model 125RA, the unit is driven directly from the truck engine through a P-80 heavy duty power take off, eliminating need for a separate driving engine. The unit can be mounted directly on the truck chassis or on a platform base and is adaptable to any type of truck body. Dimensions are 39 x 35 in., 35 in. high.

For more details circle 110 on Enclosed Return Postal Card.

Circuit Cushion

A low cost hydraulic circuit cushion, developed and manufactured by A. C. Anderson, Inc., Dept. A-60, P.O. Box 391, Wildwood, N. J., is claimed to automatically level off harmful pressure peaks which often build up in tractor hydraulic systems as the result of jolts and sudden stops of pistons and rams under load.

This small unit can be easily installed in medium sized tractors.



Davey "Auto-Air" Rotary Compressor

Requiring a minimum of maintenance, it is spring loaded and uniquely pressure balanced. Action is not dependent on delicate diaphragms, and it does not require servicing with gas.

For more details circle 111 on Enclosed Return Postal Card.

Dual-Use Steam Cleaner

A new high pressure combination steam cleaner for use both in the field and in the city repair yard is available from Malsbary Mfg. Co., 845 92nd Ave., Oakland, Calif. It is mounted on a special trailer, carrying two 150-gal. water tanks located fore and aft of the cleaner for proper balance.

Malsbary Steam Cleaner

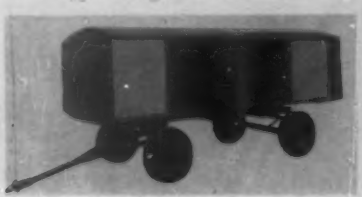
Tank capacity is sufficient for 1½ to 1¾ hours of cleaning at 200 psi. An equalizing device maintains uniform water level in both tanks. The cleaner can be operated either from the supply tanks on the trailer or from regular water supply. It also has both a gas engine and an electric motor, so it can be plugged into normal electric outlets or run by a gas engine in the field.

For more details circle 112 on Enclosed Return Postal Card.

New Portable Magazine

A portable explosives magazine that can be hauled by light truck or tractor has been announced by Austin Powder Co., Cleveland 13, Ohio. Known as Model 800, it has capacity for more than the average daily requirements of explosives, detonating fuse and caps (8,000 to 10,000 lb.). Loading and unloading are simplified by 5 large doors, 2 of which are located on either side with one at the rear.

An important feature is the fifth wheel type design of the front axle which is said to assure complete maneuverability even in close quarters. Arched tubular construction in welded steel of front and rear axle provides ground clearance and strength necessary to travel over close terrain.



Austin Magazine

For more details circle 113 on Enclosed Return Postal Card.

Portable Batching Plants

Portable road paving batching plants have been added to the line of the Baumeister Division of Chain Belt Co., Milwaukee 1, Wis. These units are claimed to eliminate much of the expense in setting up a road batching plant. Hinge-type aggregate bins and all plug-in electrical and air connections save time. Manual, semi-automatic or fully automatic batching controls provide complete control of batching for 1 through 4 34E dual drum pavers using 2 through 4 compartment batch trucks.

For more details circle 114 on Enclosed Return Postal Card.

Self-Leveling Bracket

A gravity-stabilized swivel bracket has been designed by Federal Sign and Signal Corp., 8700 S. State St., Chicago 19, Ill., to make its "Beacon Ray" and "Fireball" emergency warning lights more effective when installed on cinder, salt, sand and other dump trucks with raised bodies. The new device features a swinging, counterbalanced metal weight which prevents the light from tilting regardless of the angle of the truck or its body.

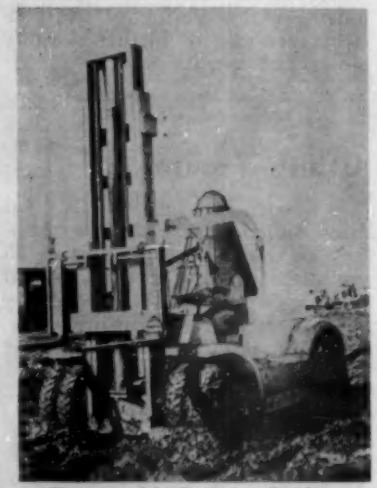
Federal Swivel Bracket

Previously, warning lights were placed on top of the truck cab and were obscured from the rear when the body was elevated. Now, emergency lights can be mounted on top of the forward wall of the body for protection from all directions.

For more details circle 115 on Enclosed Return Postal Card.

New Engine for Lift Truck

A 154 hp V8 engine with matching torque converter has been made available as optional equipment for the all-



Hyster with Chrysler Engine

weather Hyster lift trucks in the 15,000 to 20,000-lb. load capacity, according to the Hyster Company, 1800 N. Adams, Peoria, Ill.

The combination gives the truck added power for handling large loads in rough, unimproved yard areas or where mud, snow or sand pose serious traction problems.

The heavy-duty engine provides substantial power reserves for fast acceleration, speeds up to 20 mph and the ability to climb steep grades with full loads, it is said. Towing capacity of the unit exceeds a quarter million pounds. Transmission has 3 speeds forward and 3 in reverse. Within each of these 3 gears, the torque conversion unit provides a wide range of speeds and power for all types of travel conditions, from pulling out of mudholes to fast intra-plant travel.

For more details circle 116 on Enclosed Return Postal Card.

New Drill Has "Duo-Flow"

New Model 125 rotary blast hole drilling rigs, announced by Joy Mfg. Co., Oliver Bldg., Pittsburgh 22, Pa., is equipped with "Duo-Flow," a feed mechanism consisting of a combination mechanical and high torque reversible hydraulic motor and air compressor. The "125" also features a heavy duty oil bath type rotary table, double drum type drawworks mounted on a common shaft, hydraulically raised and lowered mast for fast rig up and tear down plus "Proximity Controls," which are said to give the operator complete control in position. The rig is either truck or trailer mounted with power provided by the truck or an auxiliary power unit.

(Continued on page 110)

PB-59
PAVING BREAKER
WITH
PIN-DRIVING
FRONTHEAD

DRIVE FORM PINS

FOUR TIMES FASTER

with the light-weight I-R Pin Driver

An Ingersoll-Rand PB-59 Paving Breaker equipped with a pindriving fronthead drives form pins as fast as you can set 'em! One man with a PB-59 can drive pins in from 5 to 10 seconds each—easily keeping up with the pin setter. This air-powered tool actually speeds up form-pin driving at least four-to-one.

Equipped with an easily-interchangeable Paving Breaker fronthead, the 40-lb. PB-59 has the right weight and power for a wide range of demolition, digging and tamping jobs. For complete information on the PB-59, as well as the many other items in our complete Paving Breaker line, see your I-R man or send for Bulletins 4126 and 4127A.

CONTRACTORS' COMBINATION

Ingersoll-Rand

5-516 11 Broadway, New York 4, N.Y.

THE BEST AIR EQUIPMENT FOR BETTER HIGHWAYS

. . . for more details circle 309 on enclosed return postal card

New Products

(Continued from page 108)

Flasher Safety Light

R. G. Fageol Co., Kent, Ohio, is offering a new line of battery-operated flasher safety lights, said to be visible over two miles and to afford up to 90 days of continuous operation without servicing or battery replacement.

Known as Model HD-1-7, this unidirectional light features a convex optical plastic lens of special fresnel design for maximum flash brilliance and good visibility, used in combination with an overhead mounted neon flasher tube and an aluminized reflector.

Fageol Safety Light

For more details circle 117 on Enclosed Return Postal Card.

Automatic Line Oiler

Le Roi Line Oiler

A new automatic line oiler is now being manufactured and marketed by the LeRoi Division, Westinghouse Air Brake Co., Milwaukee 1, Wis.

Lack of oil, the most prevalent cause of air tool damage, is eliminated by the Log80, said to be light in weight, easily adjusted and refillable while in use. The positive type oil-pickup feeds oil the instant drilling starts; the moment the oil supply is exhausted, the air supply is shut off automatically. Its one-pint capacity is claimed more than adequate for one shift of operation. In addition to its automatic protection, the new oiler prevents the waste of excessive oiling.

For more details circle 118 on Enclosed Return Postal Card.

No Pit for Vehicle Scale

Portable vehicle scales for road contractors and sand, gravel and crushed rock producers have been announced by Howe Scale Co., Rutland, Vt. They come in capacities to 70 tons and lengths to 60 ft. Additional scale sections can be joined; this operation requires only 9 standard bolts. These scales require no pit, which permits them to be relocated as the job indi-

Howe Vehicle Scale

TELLUROMETER

The light-weight, rugged, easily portable instrument that has revolutionized distance measuring techniques by utilizing microwave frequencies. Haze, mist, clouds, light rain do not prevent measurements. Operates in darkness as well as in daylight. Visibility not required. Accuracy up to, and including, first order.

For complete information, write, wire or phone

TELLUROMETER, INC.

Dupont Circle Building

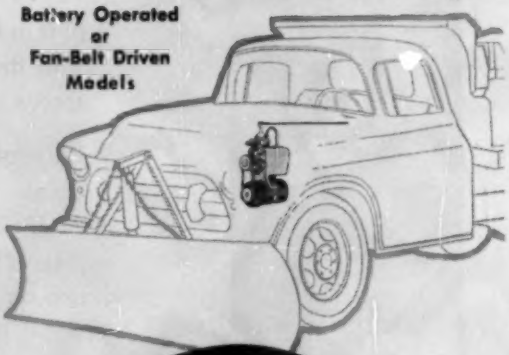
1346 Connecticut Avenue, N. W., Washington, D. C.

ADams 2-0414

. . . for more details circle 312 on enclosed return postal card

Lift Snow Plows . . . automatically!

Battery Operated or Fan-Belt Driven Models



POWER MONARCH HYDRAULIC CONTROLS

Lift or lower your snow plow automatically . . . with Monarch Power Hydraulic Controls. One man operates the plow right from the truck or jeep cab. Snow removal is faster, easier and more efficient. See your dealer or write for full details.

MONARCH ROAD MACHINERY COMPANY

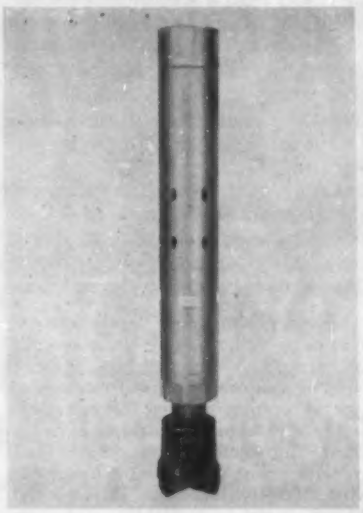
1331 MICHIGAN ST., N. E.—GRAND RAPIDS 3, MICHIGAN

. . . for more details circle 274 on enclosed return postal card

cates. They incorporate Howe's unique parallel link load suspension assembly in their platform construction, designed to absorb loading shocks and to reduce wear on the scale pivots. A wide selection of weight indications is available.

For more details circle 119 on Enclosed Return Postal Card.

Percussion-type Drill



Gardner-Denver Drill

First field reports indicate that the percussion-type "Mol-Dril" of Gardner-Denver Co., Quincy, Ill., drills 4¾ to 6½ in. blast, water well and seismograph holes with unusual speed, according to the company.

Whenever hard formations are encountered, the device may be attached to the drill stem, which conducts the compressed air supply to and rotates the drill, in place of the rotary bit. A tungsten carbide insert bit is attached to the tappet. The drill rod is eliminated.

For more details circle 120 on Enclosed Return Postal Card.

1 7/8 lb. Pneumatic Drill

A new "featherweight" air drill that weighs only 1⅞ lb. and is only 6½ in. long has been developed by Thor Power Tool Company, Prudential Plaza, Chicago. The new ¼-in. drill features exhaust noise reduction without power loss and has five-blade rotor construction for thrifty air use.

Thor Drill

For more details circle 121 on Enclosed Return Postal Card.

Ripper for Tractor Loader

A ripper for use with rubber tired tractor loaders in the 1 to 2½ yd. class has been introduced by the Ransome Corp., 2729 Hunting Park Ave., Philadelphia, Pa.

The Model R-25-75 features a 1-man rock and pinion depth adjustment and has a 3 in. by 6 in. ripping shank with a replaceable 18 lb. cast manganese tooth.

Ransome R-25-75 Ripper

For more information circle 122 on Service Coupon Page 16 and mail now.

(Continued on page 136)

finished surfaces IN ONE PASS!

it's WISCONSIN-POWERED

This power-widened finisher working on a Texas highway is built by General Road Machines, Niles, Ohio, Div. of Chain Belt Company. It's powered by a model VG4D V-type 4-cylinder Wisconsin Heavy-Duty Air-Cooled Engine.

The feature of "power-widening" *during operations* speeds up work. Operator simply pulls a lever and telescoping frames automatically extend or narrow to desired pavement width.

Power performance that matches the job performance of the machine itself is assured by the selection of a Wisconsin Engine. Such features as high torque design enabling the engine to carry the load *always* . . . tapered roller bearings at both ends of the crankshaft . . . fool-proof air-cooling . . . an OUTSIDE, easily-serviced magneto . . . all contribute to rugged power stamina.

Depend on Wisconsin Engines and the over 2,000 service stations backing them . . . several near you. Write for Bulletin S-198 pinpointing location of service stations and distributors.

WISCONSIN MOTOR Corporation

MILWAUKEE 46, WISCONSIN

World's Largest Builder of Heavy-Duty Air-Cooled Engines

. . . for more details circle 297 on enclosed return postal card

Vigilance Still Needed to Save Road Funds

(An Editorial in Michigan Roads and Construction, June 20, 1957)

We're in the clear for another year. All attempts to "raid" the road funds have been defeated.

Credit is due the Michigan Good Roads Federation for its strong, reasoned opposition to all raids; to the legislature for slapping down the utility and state police provisions; to the Governor for his veto of the bus bill.

Isn't it peculiar that whenever you raise a large enough sum of money there is always someone who has an argument as to why some of it should be his?

Now we understand that the utilities will have to spend sizeable sums in relocation of facilities along highways. But isn't it also true that the utilities occupy state owned land at no rental—that their rates are set by the state to provide a reasonable profit margin based on their costs, and that any major costs involved in relocating facilities will be considered as part of these costs?

Bus companies have problems too. They are, in many cases, faced with constantly declining revenue and rising costs. Subsidies, in one form or another, may be, in many cases, the only means of keeping some transit systems alive.

We don't think the state police ever had enough money to properly patrol the roads. A few more dollars could pay a big dividend in lives saved.

But this is the gist of the matter: with the passage of the federal highway program and increased gas taxes in many states, the public has a right to expect roads, lots of roads. These increased taxes were passed for the purpose of building roads and should be used for that purpose, none other. Money for other purposes, however worthy, should come from other sources.

Now is not the time to sit back and relax. We can expect, be almost certain, that there will be more "raids" to come, that the utilities will be back with more plaintive cries.

This year the attempt of the utilities to raid the road funds was almost funny at times. We saw one gentleman who said he was a vice president of a well-known utility company ask a senate committee if he could read a statement to them, as he was not familiar enough with the subject to discuss it. But the probability is strong that next year will bring a well-organized effort from the utilities to divert funds. Other groups, too, will be in and fighting.

Let's continue to support the Good Roads Federation in its opposition to all attempts at diversion. Let's continue to sell the "good roads" cause to the public.

COMPACT FACTS ON "DUO-PACTION": a 24-page bulletin with drawings and photographic illustrations showing types of compacting units, from smooth face sheepsfoot rollers through light and heavy pneumatic tired units to the latest "Duo-Pactor." Scrapers and graders with prime movers interchangeable with "Duo-Pactor" are also treated. The bulletin is available on request from Seaman-Gunnison Corporation, 2763 S. 27th St., Milwaukee 15, Wis.

More GIANT Sizes! More GIANT Tread Designs! More GIANT Savings!

Now at SOUTHERN TIRE COMPANY!

Probably more dirt and rock is hauled on Southern Tire retreads than on any other retreaded tires. That's because more and more contractors and heavy equipment operators are discovering the superior quality and economy of Southern Tire retreads.

Southern Tire offers not only the country's most complete range of tire sizes and tread designs, but also the world's finest retreading facilities—three-sectional molds that mean no buffing to breaker strips regardless of growth.

These facilities and use of finest tread rubber, plus Southern Tire's long experience, assure better quality with greater economy. Call your tire dealer now for facts about how Southern Tire retreads can save you as much as 40% of the price of new tires yet give you guaranteed new tire service.

● **All sizes—from 1100 x 24 to 33.5 x 33**

SOUTHERN TIRE COMPANY

1414 Broadway
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Phone Collect
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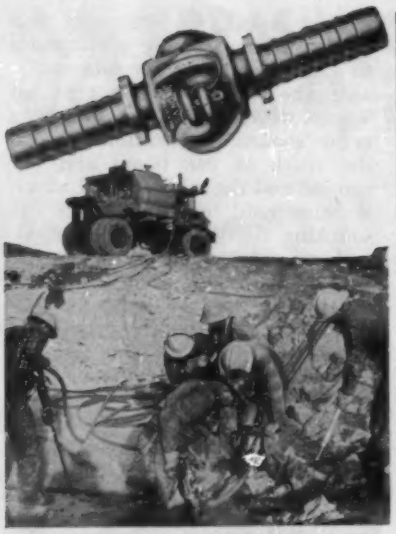
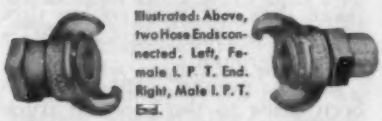


"AIR KING"
Quick-Acting, Universal HOSE COUPLING

FOR COMPRESSORS, ALL TYPES OF AIR TOOLS, WATER, OIL AND SPRAY SERVICE

This versatile coupling is built along plain, rugged lines to assure long, trouble-free service under severest working conditions.



Illustrated: Above, two Hose Ends connected. Left, Female I. P. T. End. Right, Male I. P. T. End.

The "Air King" will reduce operating costs wherever quick connections are required. Locking heads are identical for all sizes of hose or threaded ends, permitting the coupling of any two sizes of hose within the "Air King" hose end size range, or coupling to any pipe up to 1" by use of the male or female threaded ends. Heads are locked by pressing together and applying a quarter-turn. A patented Safety Locking Device eliminates all risk of the coupling coming apart. Available in bronze or rustproofed malleable iron, in sizes up to 1".

The "Air King" is made to established standards for couplings of this type and is interchangeable with other similar makes.

Also available in 4-Lug style, Hose and Female I.P.T. Ends only, in 1¼", 1½" and 2" sizes.

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HELICOPTERS AND CALCULATORS

(Continued from page 100)

the overtime hours by 1.5 and add 40 to it to obtain the total time for pay purposes. The carriage is automatically positioned, so the result of the multiplication is correctly lined up over the decimal on the keyboard which makes adding the 40 very simple and direct.

"Next we set the rate on the keyboard and, by moving a lever, the hours are automatically set up as a multiplier and, automatically, the machine multiplies the rate by the hour for the gross pay figure. This has eliminated the copying of the hours from the dials to the keyboard. The figure has to be accurate and there is no chance of a transposition."

• *In General.* In discussing factors which have governed their selection of the business machine for this part of their office activity, Miss D'Addario feels that an important consideration is the ease of operation. The automatic calculators, she has found, are so set up as to enable office workers, estimators and engineers to perform their highly varied figure work without special training, and without their having to fuss with changeovers or adjustments for different types of figure work.

In busy contractors' offices there are constant interruptions, and even these do not upset the figuring because the automatics show the progress of the work in such a manner as to make it possible to pick up the work at any point after an interruption and without the need for retracing any of the steps.

• **F. Francis D'Addario literally drops in on a job. General foreman John Benedetto stands alongside the firm's helicopter.**

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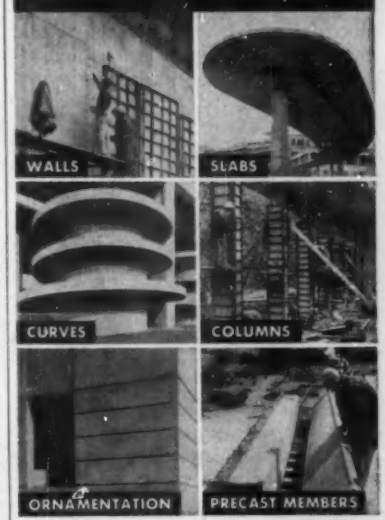

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Contractor Job Safety

Power Lines and Boom Accidents

Notes on this important safety problem as published by the National Safety Council's Construction Section "Safety News Letter."

Contact with High Voltage Lines. For many years past, the Division of Industrial Safety has continued an unending campaign against the hazards of high-voltage lines, stressing that it is a violation of safety orders to place equipment in any position from which it would be possible to swing it within six feet of high-voltage lines. During the past few years several violators of the Penal Code were convicted. Many were fined, and in a recent case the court imposed a sentence of 20 days imprisonment in addition to a fine.

Figures show that death results from one out of every three injuries caused by touching high-voltage lines. Score of Californians are killed each year when they bring tools or equipment in contact with such lines. The equipment includes cranes, irrigation pipes, well-drilling and maintenance rigs, TV antennas, spray rigs and construction scaffolds and towers.

Early in 1957, Pacific Gas and Electric and the division began a joint program to step up the educational campaign to reduce such injuries and deaths. Three pamphlets spearhead the drive: the division's "Keep Away From Power Lines" and the PG&E's "Look Up" and "Installing Your Antenna."—*From California Safety News.*

* * *

Machinery and equipment shall not be operated in a position where any part of the machine, suspended loads or lines can be brought closer than 10 feet from exposed high-voltage (440 volts or over) lines unless the current has been shut off and positive means taken to prevent the lines from being energized. A notice of this requirement shall be posted at operator's positions.—*From Safety Requirements, Army Corps of Engineers, Par. 18-9.*

* * *

Misconceptions relative to an electric line arcing to a boom are brought about by the fact that a wire has no transverse edges. Unless a man looks at the wire support he cannot tell how far the wire is away from him. That is, he cannot tell whether it is a ¼ in. wire 15 ft. away, or is a ½ in. wire 30 ft. away, and so he can't tell or see how far it is from the boom.

The only way in which a man can see the actual distance of separation between a boom and a wire is by sighting up the boom from the base of or immediately adjacent to the boom, or by sighting along the the wire with his eye very close to the wire. From any other point except those close to the wire supports, an optical illusion prevents him from determining the distance between the boom and wire. Consequently men frequently touch wires with booms and they honestly believe the boom is 6 to 10 ft. from the wire.

If every crane or boom operator who proposes to work near an electric power line would first stand directly under the wire and then drive a stake (or pole 5 to 8 ft. long) in the ground directly under the wire, I am sure that many terrible crane accidents would be avoided.

You probably know that voltage is electrical pressure which makes electricity jump and the ordinary, so-called 12,000 or 13,000-volt lines have an electrical pressure of about 7,200 volts between the energized wire and the boom, and the voltage between any two energized wires is about 13,000 volts. There are hundreds of thousands of miles of line built with the 13,000-volt wires spaced about 28 in. apart, and it should be obvious to any man who realizes this that the 13,000 volts of pressure would cause the electricity to arc between wires on poles continually if 13,000 volts would make electricity arc that far.

Actually, on a 13,000-volt line the electricity will arc less than an inch to a boom or crane, and it will arc .95 in. only at time of switching surge at the substation from which the line is served or when lightning strikes the line. Under normal conditions it will not arc more than ¼ in. from the wire to a boom.

If, however, a boom touches a wire and is then drawn away, the arc may or may not be long, and the length of the arc will depend on how much electrical current flows from the wire to the boom while the boom is touching it. Voltage is the pressure you know, like the pounds of pressure of water in a water pipe. Current in amperes is the quantity of electricity that flows, and practically corresponds to gallons of water per minute.

If the boom is supported on wheels with rubber tires and there is no "ground" connection between the truck of the boom and the ground and the cable or steel which is being held by the boom is not touching the ground, then practically no current will flow from the wire to the boom when the boom touches the wire. The boom cable and truck will be charged, however, and if a man touches any one of these things under these conditions, he will probably be electrocuted. However, the resistance of a man's body is very great, and under these conditions probably less than 1/10 of an ampere will flow through the man's body. When an ampere or less flows from the wire to the boom under either of the above conditions, there will be a very small and very short arc (probably less than half an inch) when the boom is pulled away.

If, on the other hand, any one or more of the following three conditions exist when the boom touches the electric wire, then the boom is moved away, an arc possibly as long as 5 ft. may be drawn from a 13 KV line. This can occur only after the boom touches the wire or comes within ¼ in. of it. These three conditions are:

1. When the truck carrying the boom does not have rubber tires and so is in close electrical contact with the ground.

2. If a "ground" connection has been made to the boom or truck by driving a metal rod or rods into the ground and connecting it to the boom or truck by wire.

3. When the cable from the boom is lying on the ground or is attached by a metal cable to steel members which are lying on the ground.

If the voltage of the line is more than 13,000 volts, the electricity may jump farther than one inch from the wire to a boom, but even with a 161,000-volt line the electricity will not jump more than 10 in. from the wire to the boom. Weather conditions, barometric pressure and humidity have only a very small effect on the distance that electricity will arc and this percentage is so small that it will be of no importance insofar as crane accidents are concerned.—

"Authoritative Opinions" from *Merrill DeMerit, Consulting Engineer, 505 James Boulevard, Signal Mountain, Tenn.*

A special interview

How ABRASIVE SAND problem was solved by rubber-tired tractor

You've probably seen the damage sand can do to your equipment . . . grinding away at exposed parts of earthmoving units. One machine — rubber-tired Tournatractor® — resists abrasion so well, however, that it's now the standard tractor in many sand areas. If, in your dirt-moving, your tractors frequently work in sand, or other abrasive materials, read what a sandpit superintendent — Ira Kent, Aubuchon Silica Mining Division of Portage-Manley Sand Co. at Festus, Mo. — has to say.

Q. *"Mr. Kent, why did you choose Tournatractor?"*

A. "There's a lot of sharp silica sand around here, and much of our work is on rocky surfaces. When we used crawlers, we had a major problem in track maintenance. Our sand in those tracks worked just like a grinding compound. We had continuous pad and roller trouble. So we bought a Model C-2 Tournatractor in 1950, and liked it so much we bought our present improved Tournatractor in '52."

Q. *"What sort of work does your Tournatractor do?"*

A. "We use it for just about everything. Its main jobs are stripping overburden and cleaning up around our shovels. It also builds and maintains haul roads, takes out trees, pulls heavy equipment, and does a lot of clean-up after blasting. Actually, we've found that we don't have *any* tractor jobs that our Tournatractor can't do."

Q. ***". . . and what has the maintenance record been, Mr. Kent?"***

A. ***"Well, we've worked our Tournatractor 45 hours a week for almost 5 years, without any real trouble. Our one and only major repair expense in all that time has been replacement of the torque-converter oil-seal and bearings. We've never done anything to the engine . . . not even replacing an injector or anything. We never broke an axle, chipped a gear, or had a single major thing go wrong."***

Q. *"What about the electrical system and its maintenance?"*

A. "We like this electric control system . . . and it's never given us any trouble. In all this time, we have put in only one set of discs in the motor brakes, and two little switches. But that's it, so far as repairs are concerned."

Q. *"And the tires?"*

A. "Our present Tournatractor front tires are still the originals. We replaced the two back ones last spring, after better than 4 years of service. We've never had a blow-out, on any of the four. As to changing or repairing tires — you know that on Tournatractor, changing a tire is as easy as changing an 8.25 truck tire. That's another thing we like about this dozer. Lots easier than fixing track troubles."

Tournatractor's wide, low-pressure tires flex easily over sharp rocks without cutting . . . end age-old problem of rocks, sand, and dust clogging up track assembly.

One of many spare-time jobs handled by Tournatractor is building new haul road. Operator takes overburden dirt, drifts it on down to bottom, building up road grade.

Pit Mgr. Kent says: "Main reason we like our rubber-tired Tournatractor is its go-anywhere ability. It's quick on its feet . . . handles easier . . . maneuvers easier."

This owner-verified work report indicates how Tournatractor can solve your costly abrasion problem. Rolling on big rubber tires . . . with all parts sealed and protected against damage by rocks, sand, and other harmful materials . . . it gives you years of low-cost, trouble-free service. See your nearby LeTourneau-Westinghouse Distributor for full details and a working demonstration.

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Job Ideas

Stud Shear Connectors Speed Florida Bridge Deck Jobs

Use of headed shear connectors installed in the field with a stud welding gun enabled contractors on an 8-mi. section of the Florida Turnpike to halve the time normally required for erection of composite bridge decks.

This technique involved ¾-in. x 4-in. Nelson shear connector studs. These were installed with an NS-9 gun, drawing power from twin 600-amp. gasoline-driven Hobart welders.

On the stud-welded decks for five bridges erected by the Montgomery Construction Co., a welder and a helper (who laid out the studs) installed 720 studs required for each complete 50-ft. span in about two hours. This made it possible to organize the crew into three teams,

● A stud welding gun being used to install headed shear connectors on Florida Turnpike bridge.

one behind the other. Carpenters first erected forms for the deck over one span, providing working surface for welders, who followed, with the reinforcing group close behind. When they moved on to the next span, the concreting began. Results for this method of operation were one 50-ft. span completed per day.

Risk in Mixing Greases Told in Army Report

Use mixed greases without an in-service test and you'll risk equipment failure, warns a report of Army research into the compatibility of binary lubricating greases. The report has just been released for industry use through the Office of Technical Services, U. S. Department of Commerce.

The safest plan, advises the report, is not to lubricate with mixtures of different types of greases. They are too complex for valid tests of their compatibility. But if they must be used, a compatibility test should be run involving the greases, the equipment to be serviced and actual conditions of operation.

Compatibility of eight commercial binary greases was examined during the research. The ASTM wheel bearing grease tester was rated a better laboratory indicator of compatibility than the mechanical worker. The illustrated report of the work, PB 121737 *Compatibility of Greases*, F. S. Meade, Rock Island arsenal laboratory, U. S. Army Ordnance Corps., Aug. 1956, may be ordered from OTS, U. S. Department of Commerce, Washington 25. It contains 67 pages, price $1.75.

Mobile Compressor Rigged for Driving Guardrail Posts

The machine shown here is a Le Roi Tractair unit. The frame, pulley and hoist cable mounted on it were devised to adapt the unit as a driver for steel H-beam guard rail posts. The job: a section of the Indiana Turnpike during the 1955-56 winter. The contractor: Arcole-Midwest Corporation of Skokie, Illinois.

The motive which Arcole-Midwest's foreman had in devising the rig was a good one; namely, to handle this short section of post driving, and others like it, without tying up a crane, heavy pile driver,

● Unique improvised post driver devised by contractor for work on the Indiana Turnpike.

hammer and set of leads. The machine, which anticipated commercial light-weight drivers now on the market, consisted of a diagonal frame, a paving breaker equipped with a special driving head, and a platform suspended from the winch cable. The operator, by standing on the platform to do the driving, furnished the weight necessary to do the driving job under the breaker's impact. An old discarded crankshaft was used as a counterweight to the man and platform.

Insect Spray Gun Converted for Quick Paint Jobs

Where it is necessary to keep machinery protected from seacoast dampness, a quick way to do paintings on short jobs has been devised

● A common household spray gun is used to give an instrument panel a quick paint job for protection against seacoast weather.

by Robert Jardell, of Higman Towing Co., Orange, Texas. The paint is mixed and then poured into the container of an ordinary insecticide spray gun. When the plunger is operated, the gun will emit a fine spray.

When cleaning trucks and equipment, solvent can be placed in the gun and sprayed on the greasy equipment. After allowing the first coat to stand some time, solvent is sprayed again and the remainder wiped off with rags. This is followed with light gasoline, and then the equipment is painted. Near the seashore, 2 or 3 light coats give the best results.

● Gouging out the stone—done easily by a TD-18 equipped with special 36-in. wide plow.

Novel Blade "Plows" Up Soft Rock in Florida Quarry Job

Instead of cutting with a channeling machine, ordinarily use in building-stone quarrying, or by blasting, as done in other quarry operations, a specially designed plow is used to break up rock on an operation at Ojus, Fla.

Bransfield and White, Inc., owner of the quarry located north of Miami, uses an International TD-18 crawler, equipped with an unusual plow, to excavate the Miami oolite stone.

● Here's a close-up view of the stone plow, which has shown remarkable "authority" in loosening the soft rock.

This unit makes a 36-in. swath 8 in. deep on each pass, cutting 2,000 cu. yd. per 9-hour day. Cutter wings discharge cut stone in front of tracks. Tractor grousers further reduce the soft stone in smaller pieces.

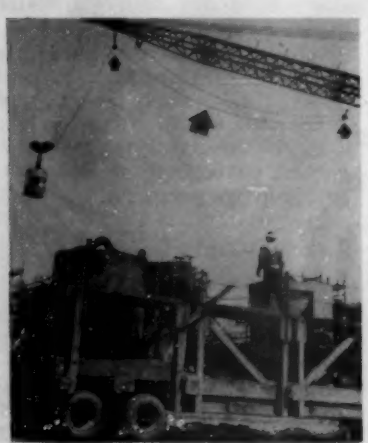
Prior to the plowing, the tractor strips overburden which ranges from 1 to 5 ft. depth. This overburden is stockpiled and later sold as fill. A dozer pushes the cut stone into a stockpile, where it is loaded out by an International Drott TD-14 Skid-Shovel, or dragline.

This operation produces about a half million tons of the material annually for use in state, county, city and private road construction in the area and for other purposes. The stone is reduced to four basic grades—ballast, road base, fill and bituminous mix.

The quarry formation seems to reach unlimited depth of usable stone but the operation works only 35 ft. below the water table. A dragline takes over the excavation from the TD-18 when the water level is reached.

Air-operated Lifting Hook for Heavy Concrete Bucket

A 220-ft. length of air hose was employed in an unusual way at Long Sault dam on the St. Lawrence Seaway and Power development. As used by the Walsh Construction Co., a Goodrich 3-braid, ¾-in. 1D hose (large arrow) conveyed compressed air for operating the remote-controlled crane hook that picked up 12-ton buckets of concrete. Inserted inside the hose was an electric cable that controls the air supply solenoid valve. The hose took special punishment because it operated over two sheaves (small arrows), according to E. W. Simpson, Walsh's project manager.



● Air hose with electric wire inside (see arrow) tripped bucket hook.

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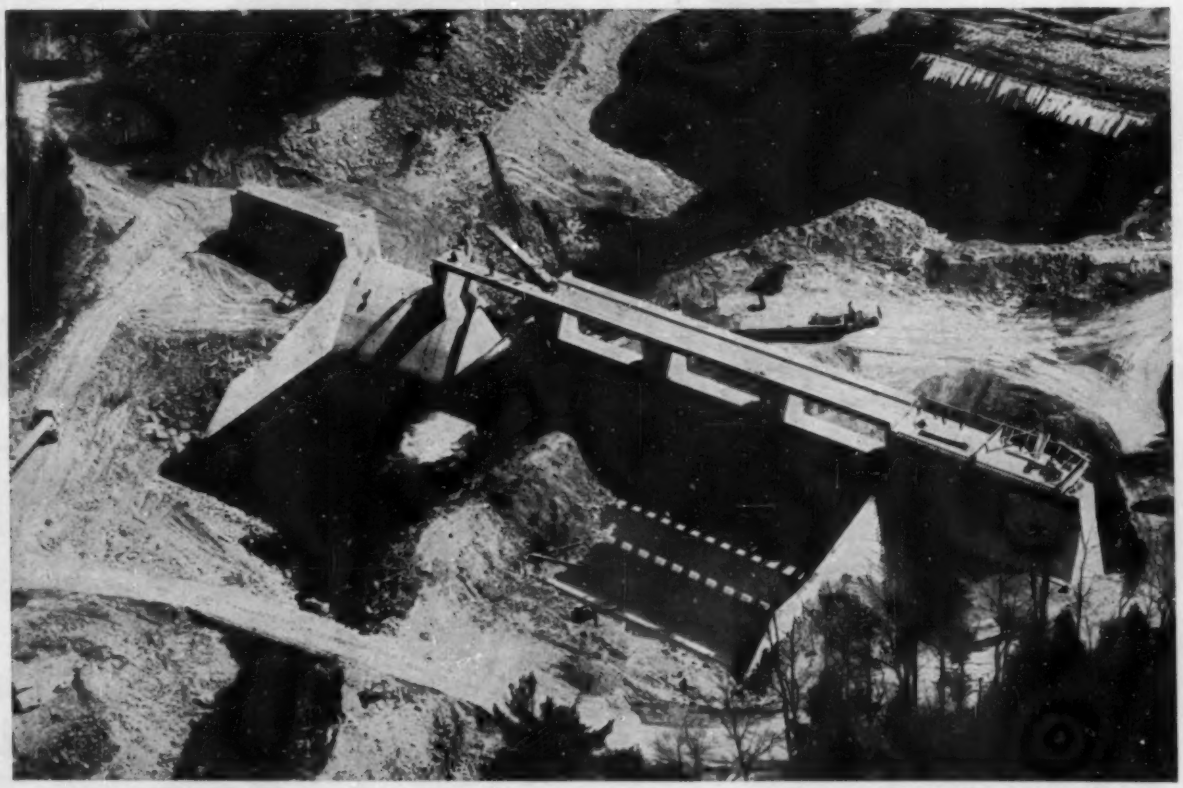

Shown here are 44 ft. long AMDEK box-section prestressed concrete members being installed at Pocono Lake Preserve Dam, Pa. This is one of hundreds of installations of AMDEK members, originated and fabricated by American-Marietta Company, whose Concrete Product Division plants are strategically placed throughout the nation.

Consulting Engineers: Justin & Courtney

Contractor: Reed & Kuhn, Inc.

Every day brings further proof of the wide acceptance of prestressed concrete as a **Versatile Structural Material*. Engineers and architects throughout the country, quick to recognize the economies and advantages it offers, are constantly finding new uses for it. As a result, precast, pretensioned members in standard cross sections are available in most localities today!

In buildings, the chief uses are long-span deck members and supporting girders. Deck members of double tee, channel sections or joists, span up to 40 ft. for floors and to 60 ft. for roofs.

Girders and bridge beams occasionally run up to 100 ft., or as long as can be transported. Bridge members are I section stringers with poured-in-place concrete slab, or box sections laid side by side.

It will pay to investigate the opportunities prestressed concrete offers. For data on tensioning materials and general information on prestressed concrete, write Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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MTS
(20 Ton Capacity)

During its two years of service, this Dorsey low bed trailer has proven its strength and maneuverability under all kinds of loads and terrain. The owners, S. T. Wooten Construction Company of Stantonsburg, N. C., also have found the MTS very easy of tires and report maintenance expense has been limited to routine greasing. Stub axles mounted on walking beams achieve unusual load stability for the MTS. The model is available in capacities of 15 to 35 tons.

For every tough job, there's a tougher Dorsey

MODEL HTS

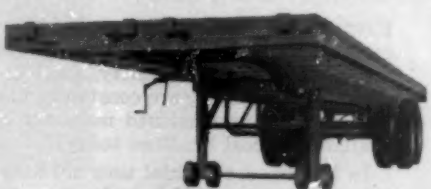
20 Ton Capacity — Weighs Only 8,750 pounds. (Also available in 15, 25, 30 and 35 ton capacities)
Although as much as a ton lighter than other trailers of comparable capacity, high-tensile steel main channels and close-spaced all-welded cross members give the HTS superior strength and ruggedness. Flat gooseneck provides support for blades and other loads.

TANDEM TILT-TO-LOAD

25,000 and 30,000 pound capacities
Weights: 6,975 and 7,150 pounds.
Speed and efficiency as well as economy are combined in this versatile tilt model! It's so light a dump truck pulls it easily. Two-way hydraulic control is so precisely balanced the weight of a man will tilt it up or down. Single axle models also available.

THE GIANT PLATFORM

52,000 lb. capacity — Weight: 8,280 lbs.
The Giant with its 18-inch main frame has earned its reputation as America's No. 1 platform! Although as much as 2,000 lbs. lighter than other platforms, it has even greater strength.



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DORSEY

For the complete facts on any heavy-duty trailer, see your Dorsey Distributor or wire collect—

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Bituminous ROADS AND STREETS

Final rolling of asphalt pavement on 47-mile resurfacing project in Minnesota, Highway 46 —see article on page 126.

Published by Gillette Publishing Company,
22 West Maple Street, Chicago 10, Illinois

DECEMBER, 1957

VIEWS AND COMMENTS

. . . By H. G. Nevitt

Compaction Control of Asphalt Paving

IN THE LAST ISSUE we outlined the need for more efficient consolidation of the mat and latest trends in bituminous compaction. This raises two questions. One is how much consolidation is needed? The other is how does the engineer control compaction, both in specifications and on the job?

There is no possible ready answer to the first question. All that can be said today is that our construction compaction on asphaltic mats for heavy duty service unquestionably needs to be greatly improved, and the amount of consolidation obtained markedly increased. Only experience can gauge this factor; and probably this experience will have to be expressed in terms of the number of passes of compaction equipment of specified characteristics.

How to Specify?

With a certain degree of compaction desired, the next question is how will the design engineer specify it, and how will the project engineer know that the results have been obtained? If, of course, the amount of compaction is expressed in terms of the compactive effort—that is, so many passes of certain equipment meeting specified requirements—a count alone of such passes is all that is required. Perhaps this is presently the best approach, for reasons outlined later. Certainly the usual method today, in which the compaction is expressed as a percentage of the theoretical or a percentage of that obtained in the laboratory, is unsatisfactory at best and downright misleading at times, as experience has frequently shown. As we understand the use of the term, compaction to a certain percent of theoretical means the attainment of a density which is a certain percentage of the density which would be shown by the mix if there were no air voids and no absorption of the aggregate into the pores of the rock. Since some absorption almost invariably occurs, which even in good aggregates varies appreciably, this theoretical figure is immediately thrown in doubt. It presupposes accurate density methods, procedures to take care of the absorption, and similar. From the purely practical standpoint it appears to us that these factors alone eliminate the term as a desirable basis of comparison.

Another objection to the percent of theoretical density is that we have no real guide as to the limit to set for any particular mix. The degree to which the consolidated pavement will approach this theoretical maximum is completely dependent upon the aggregate gradation, the type of aggregate, and many other factors. To arbitrarily assign a figure for any one aggregate on the basis of experience with other materials is completely without justification. It is not humanly possible to gauge the variations in aggregate. Only where the aggregate has actually been utilized previously under positively identical conditions can this approach be considered safe.

The percentage of laboratory density eliminates some of the objections listed for the theoretical density as a desired standard. Unfortunately its use brings in other objections equally undesirable.

Proper Tests Lacking

The basic difficulty is that any laboratory procedure utilized today and the actual mat densification achieved by construction compaction and/or traffic consolidation have little in common. Furthermore the relationship between the two varies from mix to mix. Much effort has been made to show that averages between the two procedures do correlate. This is undoubtedly possible. For example, we can take a hundred actual mixes in the field and find a certain laboratory procedure which will give exactly the same density from one hundred laboratory specimens, provided we are talking about averages in each case. This, however, means very little in controlling the compaction of any one of the particular mats involved from the corresponding laboratory sample. The relationship between the two may be far different than that between the averages. For example, it has been shown with fine graded mixes that some thirty-five Marshall blows is equivalent to a certain amount of traffic consolidation, whereas for coarse graded mixtures it may take fifty blows to get the same correlation. Yet the variation between these correlations for any particular job may be even greater; and this deviation increases with the use of aggregate varying widely in type—an inevitable result in the desirable utilization of local materials.

How Density Achieved

The effort to find a correlating laboratory procedure has not been abandoned. Nevertheless, the practical hopelessness of this effort with all presently used laboratory techniques will be realized through resort to engineering analysis. An outline of this procedure was contained in the writer's presentation in connection with the "Symposium On Compaction" at the Atlanta AAPT meeting. We showed that the consolidation obtained in the road, or the density achieved in the laboratory specimen, is the result of the interplay of a considerable number of variables. The application stresses (which involves their magnitude, direction, duration, etc.), the various resistance factors, and other variables all enter into the picture. Since these variables change from project to project or mix to mix, it is simply impossible to anticipate finding a laboratory procedure which simulates closely compaction on the job unless the laboratory procedure simulates in every respect the conditions in the

field. So far no one has come up with any laboratory procedure which seems to meet this requirement, or even approaches it, outside of the small test track, which is hardly to be judged a control operation.

Proponents of various laboratory compaction techniques may strongly disagree with the above statement, and within limits some methods may appear to give a good correlation: but rigorous analysis indicates that for close control from job to job no approach has yet proven its validity—though some are unquestionably far superior to others.

What should be done about this? It is our personal view that field control in terms of specified compaction equipment, number of passes and similar is desirable despite our strong preference for end-product specifications. This is particularly true if the field equipment is of the pneumatic type. We should be able to get a correlation between traffic passes and pneumatic roller passes even though the pressure of the pneumatics is varied as the compaction proceeds. It will not be too hard to set up certain standards of equipment and passes required to produce a certain result. On the basis of this compaction, standards for other jobs can be satisfactorily reached.

How Much Compaction?

While doubting that anything really satisfactory is possible from a laboratory equipment approval, we do not mean to indicate that utilizing such an approach will necessarily result in inferior work. As indicated early in our discussion, we do not yet know how much compaction is required for certain objectives. Consequently a laboratory or theoretical density basis of control may happen to give the right answer and produce a satisfactory job. It could, however, instead be a job in which the compaction is insufficient, or one in which far more compactive effort and expense were resorted to than was needed.

At the present time it seems safer to get the rolling specified with machinery that will do the job—namely, pneumatics—and make certain that enough passes with suitable equipment are called for. Certainly rolling by the use of steel tires cannot be controlled in any such fashion. We simply do not have a proper correlation between steel rolling and compaction to safely say that any given amount of steel rolling will unquestionably provide the needed consolidation.

Furthermore steel rolling produces no orientation or other needed effects. We can specify steel rolling to obtain smoothness and some squeezing together of the particles, but for true consolidation we must go to the pneumatic.

Obviously more engineering attention is needed in this matter of compaction control.

Consultant's Thinking on Pneumatic Rolling

Comment received by letter from W. B. Warden, Miller-Warden Associates, Consultants.

IN REPLY to your question regarding pneumatic rolling, Schuyler Hudson, of our staff, and I have prepared the following comments

Actually this whole subject of compaction at the time of construction versus post compaction due to traffic over the life of the pavement is currently receiving a great deal of consideration. The importance of resistance to channelized B-52 traffic for airfield construction has focused attention on this construction variable. Recent meetings between the Corps of Engineers and various facets of industry in Vicksburg and in Atlanta helped highlight the subject.

In our opinion the compaction of bituminous pavements to ultimate density by the use of heavy self-propelled rubber rollers immediately after placement of the mix will eventually become standard construction practice. Among the advantages are the sealing of the surface against entrance of moisture without added expense of a seal coat, and the immediate proof of the validity of mix design.

Our interest in this type of compaction dates back to about four years ago when we conceived the idea of a self-propelled rubber tired roller with operator controlled variable tire pressure. The advantage of this feature would be that initial passes could be made without rutting or deforming the pavement, and then tire pressure could be increased, as additional stability was obtained through compaction. Final passes with high inflation pressure would insure that the material was over-consolidated with respect to actual traffic and not subject to further deformation.

Excellent Results

Since then we have made a limited investigation in connection with airfield construction, which indicated that a pavement layer compacted with conventional steel-wheeled rollers had a definite density gradient, with the highest density at the *lower* surface of the layer. The increased density obtained by rubber tired rolling of the mix while still hot appeared to be due partially to the removal of this density gradient and obtaining uniform density thru the entire thickness of the layer.

We are informed that the Corps of Engineers has been experimenting with this type of equipment at WES with very excellent results. As a consequence the Specifications for the Bituminous Pavement at Columbus Air Force Base, Mississippi (where the new Proof Tests for Flexible Pavement Design will be made) require a Heavy, Self-Propelled Rubber Tired Roller as a part of the construction equipment. The roller is to be self-propelled with smooth tired multiple wheels. Each wheel is to be loaded to a minimum of 4500 lb. and the tires are to be inflated to a minimum of 90 psi. It is understood that both Bros and Ferguson rollers meet these requirements.

Significantly the specifications also contain the requirement that "Rolling of the Binder and Surface Courses with the heavy, self-propelled rubber tired roller shall be continued until a density of 98 percent and not over 100 percent of the density of a laboratory specimen of the same mixture subjected to 75 blows of a standard Marshall hammer on each side of the specimen has been obtained."

This should be of interest to those contractors who have attempted to obtain 98 percent of Marshall density with conventional equipment.

Court Decisions

Contractors Should Know

Zoning Law Prohibitions

In its performance of a contract for the reconstruction of four and a half miles of state highway in Massachusetts, known as the Newburyport Turnpike, the contractor agreed to furnish 232,200 yards of gravel. The gravel it took from its own premises. These premises, however, were within a zoned area from which it was forbidden to sell sod, loam, sand, gravel or stone.

When the town sued for an injunction against the sale of the gravel in this construction work, the Massachusetts court said in its denial of that that application,

"The contract required much more than the mere aggregation or collection of the materials enumerated in the quantities specified. Some of the materials had to be fabricated and prepared before they could be incorporated into the road. Some of the material lost its identity by being mixed with other materials. All of the material was to be wrought into a single completed section of highway.

"The essence of the transaction was not the purchase and sale of personal property. While the amount of labor involved in the performance of the work is not specifically disclosed, it is plain that the contract is one for work and labor rather than for the purchase and sale of personal property."

Town of Saugus v. B. Perini & Sons, 25 N.E. 2d 1, Massachusetts, March 15, 1940.

Repair or Improvement

Claim was made by a southern paving company on the Alabama State Comptroller for $12,989.41, representing asphalt plant mix furnished the state and the labor cost in spreading the mix on the highway. The comptroller, on his part, based his refusal of payment on a 1940 statute requiring competitive bids for public improvement contracts, which the state and the paving company had failed to observe in this instance.

That statute, however, had been amended in 1947 by adding a provision, "The term 'public improvement' shall not include repairs, alterations and renovations by institutions controlled by boards of trustees or similar boards," and a reference to the repairing of improvements had been omitted.

In its award of the amount claimed by the paving company the Alabama court said, "It is the view of this court that by expressly repealing this statute which included repairs to roads in the definition of a 'public improvement' and substituting therefor a definition of 'public improvement' leaving out repairs to roads, the legislature clearly expressed its intention of excluding repairs to roads from the operation of the competitive bid law."

Glencoe Paving Co. v. Graves, 94 So. 2d 872, Alabama, February 21, 1957.

Picketing Injunction Denied

Suit was brought in Kansas by a contractor engaged on two state highway projects for an injunction against the picketing by a labor union of its supply base and headquarters. In its denial of the right of the contractor to this injunction the Kansas Supreme Court said, in substance, that the contractor had charged that the picketing had been induced and ordered by the union for the purpose of coercing and compelling the contractor's employees to become members of that union.

The National Labor Relations Board, said the court, had exclusive jurisdiction of such a controversy and consequently it was outside the power of the state court to grant the relief sought by the contractor.

Kaw Paving Company v. International Union, 290 Pac. 2d 110, Kansas, November 12, 1955

Street Improvement Damages

Under a contract for grading a San Francisco street, the contractor followed the city's specifications and raised the level of the street five feet above the land bordering on the highway. Instead of applying for an injunction against the raising of the level of the street the owners, after the work had been done, applied for a court order for the restoration of the street to its original level.

In its decision the court held the contractor free of liability in following the city's specifications. Further, as the contract had been fully performed, the owners of the property bordering on the street were relegated to an action simply for damages. "The contractors not being liable for the impairment certainly cannot be compelled to restore the status quo" asserted the court and added, "To remove a completed and accepted street built according to government approved plans and specifications cannot legally be done."

Anderson v. Fay Improvement Co., 286 Pac. 2d 513, California, August 2, 1955.

Negligence in Building Removal

Judgment was rendered against contractors for negligence in the removal of buildings in the widening of an Arkansas highway. Owners' agreement with the state was that the state relocate the buildings and set them up in the same condition as they had been.

In their defense to this suit the contractors insisted that as the contract was with the state the owners could not look for damages to the contractors. "The gist of the action," said the court, "is the breach by the contractors of the duty they owed these owners not to injure their property by any wrongful or negligent acts."

Buc Ton Construction Co. v. Carlson, 280 S.W. 2d 408, Ark., June 20, 1955.

Contractor's Payment Bond

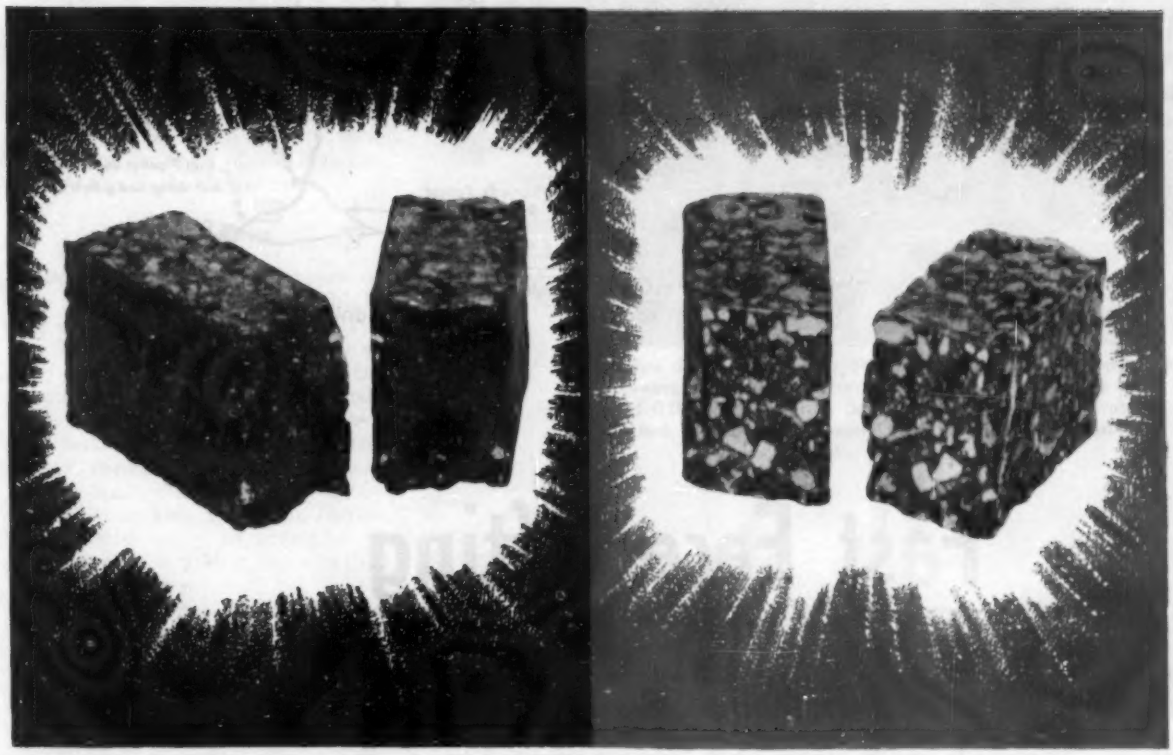
On an Oklahoma highway project, a bond was given by the contractor for payment of material and labor. In a suit by a truck owner for services in hauling equipment to and from the job, judgment was rendered against this surety.

"Recovery," said the court, "has been allowed for labor expended in transporting the material to the place where it is to be used in the public improvement and for rental on cars, trucks and equipment in the transporting of the material. Transporting the equipment to and from the job is just as essential as labor on the project."

National Automobile & Casualty Ins. Co. v. Adair, 292 Pac. 2d 403, Oklahoma, November 15, 1955.

Naugatuck SURFA-SEALZ

RUBBER ADDITIVE FOR ASPHALT PAVING



This picture proves a point

THESE paving-surface specimens, compacted of aggregate and asphalt for standard impact tests, were forcibly broken apart by weights dropped from above. Just *how* and *where* they parted speaks volumes for the addition of *rubber* to asphalt or bituminous cement!

The specimen on the left (#1) contained *no* rubber; while the one on the right (#2) contained Surfa-Sealz® in the recommended proportion. It is quite evident that specimen #1 cracked and separated *through the asphalt*. On the other hand, in specimen #2, the very stones in the aggregate actually fractured before the rubberized asphalt binder yielded, under an impact many times greater than that which split specimen #1.

Call this a labortory test if you will, but what more convincing and practical demonstration is needed to prove the greater toughness and adhesion which Surfa-Sealz adds to asphalt? The advantages are even more pronounced at winter temperatures.

Very little imagination is needed to translate these facts into terms of more crack-resistant highway surfaces and greatly reduced maintenance costs.

US RUBBER

United States Rubber

Naugatuck Chemical Division

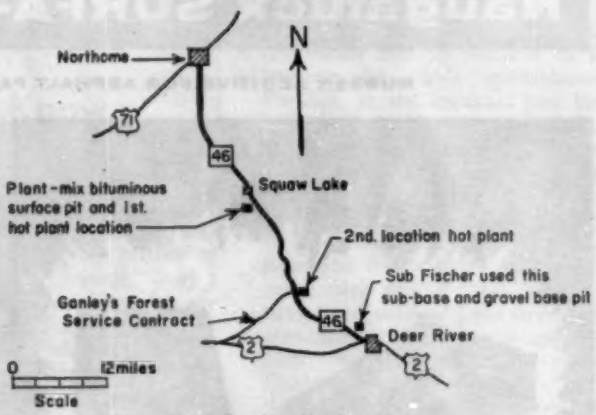
Naugatuck, Connecticut

BRANCHES: Akron • Boston • Chicago • Memphis • New York • Philadelphia • **Mfg.:** Naugatuck • Gastonia • Los Angeles • **CANADA:** Latex Div., Dominion Rubber Co., Ltd., Montreal • **Cable:** Rubexport, New York

Rubber Chemicals • Synthetic & Reclaimed Rubber • Plastics • Agricultural Chemicals • Latices

. . . for more details circle 275 on enclosed return postal card

● Sideboarded International S-180 truck loaded with subbase aggregate on scales with trash and oversized gravel in foreground. D8 U-dozer and Allis-Chalmers HD-15 Tractomotive loader at trap shoved 300 tons per hour.



Location-Ganley Contract

Fast Face Lifting

47 miles of Minnesota Highway 46 improved in one contract during one short summer

ONE OF MINNESOTA'S longest recent highway improvement projects, 47 miles in length, was carried out in the rainy summer of '57 between Deer River and Northome. Howard Ganley, Inc., of St. Paul had the $551,000 contract. The proposal of April 27 stipulated 110 working days and provided for liquidated damages. The contractor started on July 10 and finished ahead of time, and in doing so gave an example of expeditious and skillful job handling.

The southerly 10 miles of the project involved considerable granular base preparation ahead of the bituminous hot-mix wearing surface. The base work was subcontracted to the Fischer Construction Co., of Farmington, Minn.

The major items in the prime contract included: 87,864 tons of 3-in. minus gravel, 87,864 tons of subbase construction, 297,700 gal. of emulsified asphalt, 3,472 tons of AC-1 asphalt, 13,204 tons of bituminous binder, and 54,050 tons of bituminous wearing surface.

The design policy in rebuilding this road was to leave intact all such pavement as appeared to be in good condition and suitable base for a new bituminous wearing surface. Such pavement was given a bituminous binder course where-

● Sandy subbase had soft surface which rutted easily under traffic until final consolidation with pneumatic rollers.

● Existing pavement was strengthened with granular subbase where required for strength or to improve grade.

ever necessary to correct grade. Where limited areas of pavement appeared to be distressed or showed signs of failure, the areas were removed and replaced with granular material. Most of the south end was considered inadequate as base and was reinforced. Reinforcement consisted of a subbase of variable thickness using 3-in. minus material, and a 3-in. thick emulsified asphalt treated base placed in 1½-in. layers. Pavement consisted of one 2-in. lift of hot-mix asphaltic concrete.

Aggregate Pits

Following the usual practice of the Minnesota department of highways, the contractor was given the option of using a designated pit as the source of aggregates. In this instance, two pits were designated: one near the center of the project for bituminous aggregate and the other convenient to the subbase work. Such pits, designated prior to the time bids are taken, constitute a free source of aggregate to the contractor and a considerable saving to the state.

The designated pit for subbase was entirely wooded and required clearing and grubbing. There remained considerable trash in the form of roots and vegetation which could not be removed easily. The presence of roots and foreign matter slowed up the rate of feed through the loading hopper. Another factor which slowed up production was the relatively low specific gravity of the sandy material. In discussing the effect of the trash and the light sand, superintendent Eugene Fischer pointed out that the material simply would not feed through the hopper as fast as would a heavier gravel. To substantiate his contention he cited his experience in other pits where the same plant had produced 4,300 tons per 10-hour day as compared to an average of 3,500 tons in this pit.

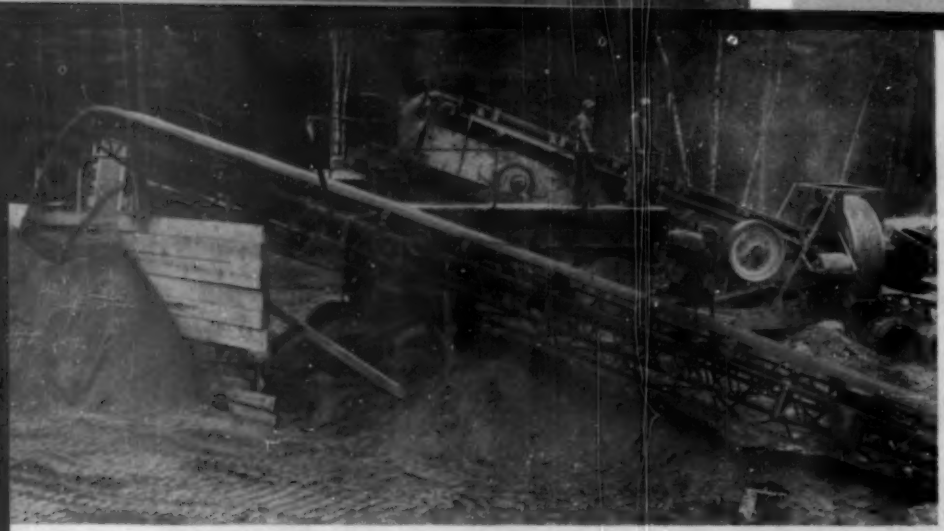
● A Hyster grid roller proved effective in compacting sandy subbase.

● Northwest dragline removed frost susceptible material in all areas where existing pavement showed distress or signs of failure.

As can be seen in the accompanying photographs, the subbase pit had little oversized material; too small an amount for it to be economical to use a crusher to reduce the oversize. Fischer followed customary Minnesota practice in the pit, using two tractors to push the aggregate into the hopper. An Allis-Chalmers HD-15 and a Cat D8, V-dozer were used to secure production and not for the purpose of blending, as the pit ran quite uniform in gradation. From the hopper the aggregate was conveyed to a vibrating screen. Fischer used his own fleet of 12 International S-180 sideboarded trucks to haul 11-ton loads an average of 7 miles. Three-inch screens were used for the subbase and 1-in. screens for the emulsified base aggregate.

The subbase material was truck-dumped in a windrow on one side

● Spreading material for widening strip along shoulder of existing Asphaltic surface, Minnesota highway 46. Dunn Shoulder Widener used, pushed by a Galion motor grader.



● At left is wasted material from both crushers. Finished aggregate was loaded directly from Diamond jaw and roll crusher at rear.

of the highway. The length of spread per truck was governed by the net weight of aggregate and was measured off for each truck. Motor graders then pushed the windrow to one side to give as much room for traffic as possible.

As soon as a suitable length of windrow (one-half mile or more) was in place, the same motor graders spread 3-in. lifts for compaction. A combination of grid and Dunn "Flatiron" pneumatic rollers proved most satisfactory in this sandy aggregate. Rollers had to be used in close conjunction with water wagons and motor graders, as traffic tended to rut the surface badly until it had been consolidated and had had time to set up.

The same truck-dumped windrow process was used for the two 1½-in. emulsified base course layers. A Seaman-Andwall Pulvi-mixer was used to road-mix from 5 to 6 percent of emulsified asphalt into the base aggregate. The treated windrow was spread with motor graders and rolled with the Dunn pneumatic rollers to the required density and surface texture.

● Bituminous binder and wearing course was mixed in Barber-Greene continuous plant, averaging 172 tons per hour.

The second time the project was visited was in the morning after heavy thunder showers the preceding night. It was noticed that there was a considerable erosion loss on the shoulders of the subbase. It appeared that considerable material and work would be required to replace the eroded material. In contrast the erosion was minor in extent where the emulsified base course was in place.

Howard Ganley, Inc., had a high-speed crushing operation going in the hot-mix aggregate pit. Under the supervision of Earl E. Roettger, this plant produced 2,500 tons of ¾-in. minus aggregate per 10-hour shift.

This pit was a good coarse aggregate and required no blending to secure specification material. The contractor did have a laborer kicking 14 in. and larger boulders off the primary conveyor to keep from

● Pioneer unit scalped most of reject on screen and used jaw crusher to reduce pit material to 3-in. minus before passing it on to second crusher unit.

overloading the first unit. A Cat D8 with U-dozer and a Cat D8 dozer worked the pit. A TD-14 International tractor was used for stripping on this job.

The crushing plant consisted of two factory production units. The first unit was a Pioneer scalping screen and 1536 primary jaw crusher. The scalping screen removed specification material and the jaw reduced the rest to 3-in. minus. The second stage was a Diamond No. 77 plant with 10-36 jaw and 22-36 rolls, powered by a Murphy diesel unit via twin disc clutch and direct coupling.

Using a Barber-Greene continuous plant, Ganley produced an average of 172 tons per hour of hot-mix bituminous binder and wearing surface material. (On September 5 Ganley reported 47,600 tons of mix production in 43 calendar days for this job and an adjoining one served by the same plant.) International S-180 and GMC 640 trucks were used to haul the hot-mix to a Barber-Greene spreader. Rolling was with a Huber tandem 10-ton roller for break down, Bros self-propelled pneumatic for kneading and compaction and a Galion 10-12 ton tandem roller for finish rolling. Two-way radio equipment on the Galion was used for relaying instructions from the hot-plant to the finisher crew.

The hot-plant was located initially near the crusher and the north part of the project was served from this location. Then the plant was moved 12½ miles south, where it supplied the rest of the job and also another project in the area. Twelve trucks hauled aggregate to the second site.

Ray Smith was superintendent for Howard Ganley, Inc. E. C. Swenson was project engineer for the state assisted by Gordon Johnson, inspector under C. M. Larson, district engineer.

Rubber Road Experiments by Natural Rubber Bureau

It has been generally accepted that the addition of rubber to asphaltic materials will add to the binder's ability to retain stone. The double-barrelled question is, though—how much retention will be provided, and how much rubber is necessary.

Two experiments that will help answer these questions for road engineers around the country have just been put down by the District of Columbia and Georgia in collaboration with engineers from the Natural Rubber Bureau research laboratory.

The D.C. job used three types of material in its trial—standard cut-back asphalt, tar, and cut-back containing natural rubber. This particular rubberized cut-back used rubber from latex, a combination just introduced by Natural Rubber Bureau research laboratory engineers. Tests indicate that this type of natural rubber is the most economical developed to date, in that less than can be used to obtain desired results.

The three D.C. materials went down in consecutive stretches on about three blocks of a medium-well-travelled street. A cover of slag was placed on the tack in a single application treatment. H. F. Clemmer, engineer, materials and tests, D.C. Department of Highways, and J. D. Watkins, superintendent of maintenance for the department, cooperated in the laying.

In the Georgia experiments, about 6000 ft. of Route 54 near Sharpsburg was covered with three varying emulsions containing respectively 1, 2 and 3 percent of natural rubber. Each of the three was laid in 1200-ft. segments; each was followed immediately by a 1200-ft. control in what might be called a straight-line checker-board pattern. This technique was used to permit ready comparisons of the various amounts of rubber against each other and the non-rubber controls.

Over the entire length of the strip a uniform stone cover was used, so that, except for the differing percentages of rubber, all elements were the same. While the traffic in this area is not overly heavy, a fairly large number of tractor trailers use this route.

Cooperating with J. York Welborn and Dale Fisher of the Natural Rubber Bureau research laboratory in developing and laying this stretch were M. L. Shadburn, Georgia state highway engineer, and J. O. Bacon, maintenance engineer.

Report Positions Open in the Public Roads Bureau

The United States Civil Service Commission announces that there is still a need for highway and bridge engineers for duty with the Bureau of Public Roads and other Federal agencies:

Twenty-five highway and bridge engineers in Central America, entrance salaries $6,115 and $7,035 a year.

Highway and bridge engineers are also needed throughout the United States in positions paying from $4,480 to $8,990 a year.

And trainee jobs are open at $3,415 to $4,480.

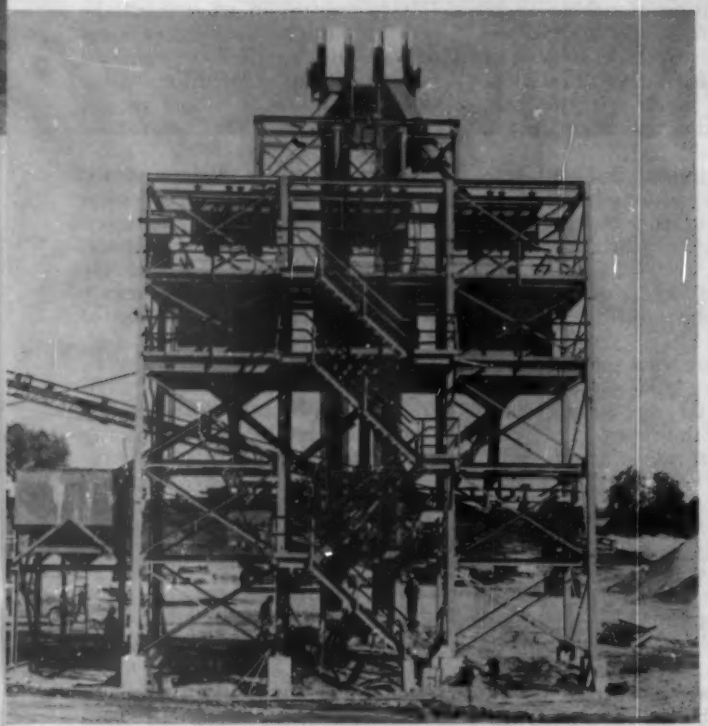
Applicants must have had appropriate education and/or experience. Full information regarding the requirements and how to apply may be obtained at many post offices throughout the country or from the U.S. Civil Service Commission, Washington 25, D.C., by asking for Announcements Nos. 70B, 71B and 75B.

Applications will be accepted by the Board of U.S. Civil Service Examiners, Bureau of Public Roads, Department of Commerce, Washington 25, D.C., until further notice.

● Downpours accompanying thunder storms badly eroded sand subbase.

Soft Stone Separated Out by

New Gravel Up-Grading Plant



● General view of the plant. The two compartments on the right are for first-stage separation; the one on left, second-stage. The bin to the left of the plant is for discard.

Difference in elastic bounce of inferior stone from hard gravel particles utilized in vibratory separator developed by Blaw-Knox engineers.

A NEW PROCESS for upgrading gravel from natural deposits has been developed by the Construction Equipment Division of the Blaw-Knox Co. The first commercial plant was in operation during 1957 at a pit of the Whittaker and Gooding Company near Ann Arbor, Michigan.

It is now possible, according to Blaw-Knox, to mechanically grade gravel, removing soft stones from the hard, desirable, coarse aggregates needed in construction. Aggregates at the Whittaker and Gooding Co. pit naturally contain from 5.0 to 8.0 percent of soft stone. They have been beneficiated at a cost of a few cents per ton, making a product restricted to any desired percentage of soft stone from 0.5 to 3.0 percent.

Beneficiated gravels locally produced by this method often can be made available at far lower cost than materials shipped in from distant points. And aggregate quality can often be upgraded, resulting in more durable concrete. The importance of the problem, according to Blaw-Knox, is indicated by recognized information that about 50 cents to $1.00 is spent on maintenance and repairs of concrete roads for every $2.00 spent in constructing new highways. Much of this maintenance cost can be traced to poor quality aggregates.

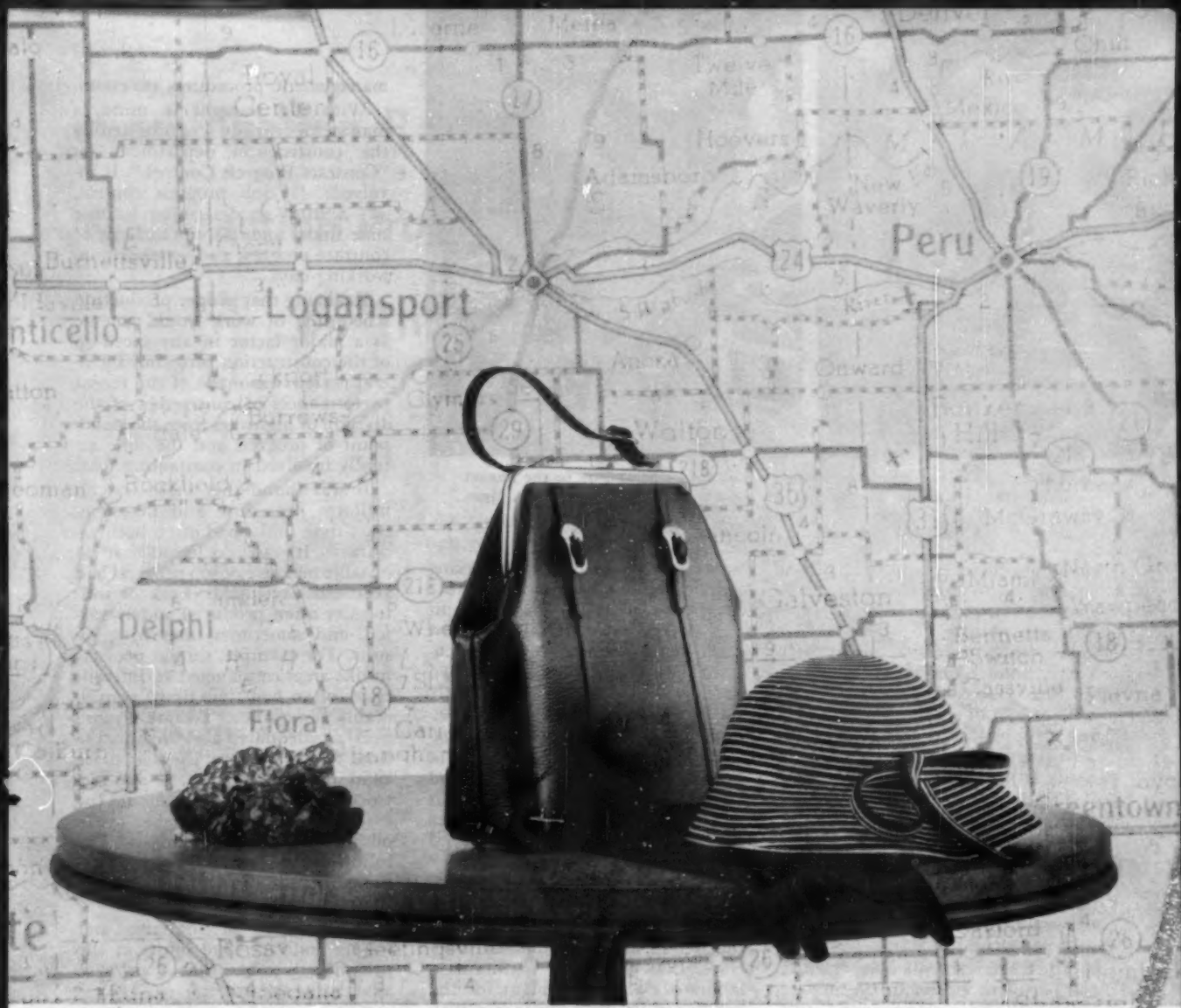
Paul Wolfert, general sales manager of the Construction Equipment Division of Blaw-Knox Co., predicts that many state highway departments will tighten coarse aggregate specifications in the near future. At present a typical specification requires that aggregate contain no more than 3 percent of soft stone and no more than 5 percent of hard absorbent stones. The maximum content of chert, a highly siliceous sedimentary rock, is frequently specified as 3.0 to 5.0 percent. The sum of the percentages of the three deleterious component stones cannot exceed 8.0 to 10.0 percent, depending upon the particular aggregate specified. It is obvious that the ideal aggregate should contain none of the deleterious stones.

Since natural gravel deposits contain both good and poor quailty aggregate, Blaw-Knox engineers began looking into the problem and with the assistance of Dr. E. H. Leslie of Ann Arbor, Mich., developed a process and plant for this condition.

The plant is relatively simple, consisting primarily of bins, conveyors and elevators, vibratory feeders and impact plates. It can be operated and maintained, according to Blaw-Knox, by personnel normally employed in gravel pit operations.

The process makes use of the fact that the soft deleterious materials have elastic properties widely different from the hard, sound stones. The stones are elevated into an overhead hopper. From this hopper they are gravity-transferred to a vibratory feeder. Stones are delivered from the lip of the vibratory feeder in a controlled manner so that they drop in the required pattern on to the surface of a massive inclined plate, made of abrasion and impact resistant alloy steel.

The bounce of the stones depends upon their elastic properties and their shape. The hard stones of any



Someone is going to get taken for a ride

A Materials Interchange Plan can make it happen sooner—and make it a happy one . . . with 65 million cars on the highway—20 million more in 10 years—someone is getting taken for a ride . . . every minute of every day. Let's make it a happy ride. Current highway construction programs can do it. A *Materials Interchange* design and specification plan that includes Asphalt can help grandma get taken for a pleasant ride sooner.

Here's what at least one Midwest state is doing about it: Highway authorities have drawn plans for alternate types of construction. Materials available at the time of construction will be used. No time is lost in this construction program. No experienced engineering manpower is lost rewriting specs and redesigning projects.

Make this your plan. Employ *Materials Interchangeability* so that roads under your authority may be built from materials available at time of construction. Include Asphalt in your construction planning.

Remember these facts: Standard Oil produces Asphalt at four convenient Midwest locations. Tank car and tank truck deliveries are made to you from the Standard Oil refinery nearest your job. Technical Service on Asphalt for highway construction is provided by Asphalt construction specialists who work out of 23 Standard Oil offices all over the 15 Midwest and Rocky Mountain states. Standard Oil has a record of taking care of its customers demonstrated by its delivery on contracts in times of short supply as well as when materials are plentiful.

Get more facts about STANDARD Asphalt from the Standard Oil office nearest you. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

. . . for more details circle 282 on enclosed return postal card

STANDARD

STANDARD OIL COMPANY
(Indiana)

● (Left): Two of the vibratory feeders which feed material on to the impact plate. (Right): Stones being fed to impact plate, one layer at a time.

given gravel will respond in such a manner as to give a characteristic distribution curve. The soft stones will also pattern themselves into a curve—but a different, and shorter curve. Bounced stones are collected in three separate compartments with stones of similar elasticity being dropped into the same bins. The compartments are separated by easily adjustable dividers.

The divider furthest from the impact plate is set at a distance from the plate so that the product in that compartment will contain the desired composition. For example, an aggregate composed of 99 percent by weight of hard stone and 1 percent per weight of soft stones.

The material collecting in the compartment closest to the impact plate will be predominantly soft stones and will be discarded from the stage. The material collecting in the middle compartment will contain some hard and some soft. This is automatically and continuously recycled to the feed to be dropped again on the impact plate.

The net result of the operation of the first stage is the production of beneficiated product and a discard. The discard from the first stage still contains too large a percentage of hard stones to be rejected. To recover the larger part of the sound hard stones, the first stage discard is fed to a second and smaller separating stage. The operation of the second stage is analogous to the first.

The material can thus be graded to any desired soft stone percentage by shifting the bin dividers. The further the last divider is placed from the impact plate, the higher quality the stone collected.

Elastic fractionation is applied to well-washed, naturally occurring pebbles graded from No. 4 up to a maximum of 2½ to 3 in. The pit run or dredged material should be washed and screened in the conventional manner. The beneficiated product is screened and lightly washed to produce beneficiated aggregates of required size grading.

Even though the Whittaker and Gooding Co. plant is a new model —the first commercial plant of this type ever built—they report ease of operation, economy, upgraded product and little maintenance.

Since the plant must be engineered to some extent to the type of natural gravel deposits found in the area in which the plant will operate, Blaw-Knox Co. maintains a laboratory and pilot plant for the purpose of testing samples of gravel. Blaw-Knox is making these facilities available to all gravel producers for testing samples.

Study on Management Control Of Highway Construction

By Milton Harris. Western Construction, June 1957; Highway Research Abstracts, October, 1957.

Accelerated highway construction programs are requiring more management controls to be put into effect by state highway departments. Today in California there was a $350,000,000 construction program (including rights-of-way) for 1957 and the efficient handling of this volume demanded changes in past practices. Responsibilities under such circumstances must be further delegated and decentralized. Such a trend makes new controls and management procedures necessary.

With this thought in mind, a management study was initiated by the construction department on "Contract Progress Control." It involved: (1) job progress control, (2) a study to determine feasible time limits and (3) the analysis of contract progress and weather non-working days.

Realizing that proper production scheduling of work would emerge as a major factor in any speed-up of the construction program, a general review was made of the recent performances of contractors of the division of highways from the standpoint of progress and the time actually involved in completing jobs.

It was found that there was no uniform procedure and that contract time limits had often been arbitrary. It was also found that no suitable measure of job progress had yet been developed. Lack of uniformity often produced widely varied, and sometimes interesting results. For example, similar projects in like areas constructed at different times often had time limits considerably at variance. To insure more nearly adequate and reasonable time limits, and to provide more rigid progress analysis, it was decided that every effort should be made to develop reasonable methods and procedure of analysis. The following objectives were determined upon:

1. A method of analyzing and setting contract time limits in the preliminary stages, that is, prior to advertising the project.
2. A reasonable guide to determining progress of contract work.
3. A method of analyzing and interpreting contract progress.
4. A method for determination of "weather non-working days."

Completion of the general review of selected construction projects suggested that a reliable indicator of construction progress could be deduced from the relation between estimate payments and time elapsed. The common denominator seems to be the dollar value of work performed, even though every effort was made to find a common value to be applied to production.

A detailed analysis was made of 45 projects considered to be typical of jobs diligently prosecuted.

As a result of these job studies, a satisfactory relation between time-worked and job-progress has been developed in California.

Combination Roller Handles Scattered Compaction Problems on Thruway

Rolling of structure and trench backfill and other compaction work on urban expressway job expedited by mobile unit having both rubber and steel rolls.

● **Ready adaptability to back-and forth rolling is clearly demonstrated here. Machine backed up like a truck without jacknifing, making it possible to work in areas where towed compactors cannot go.**

UNION BUILDING and Construction Corp., Passaic, N.J., ran into unusual compaction problems on their 4.7-mile section of the Niagara Thruway in Buffalo, N.Y. Backfill around eight bridges and three grade separations on their $8,022,000 job required compaction equipment to work on steep grades and in extremely tight quarters. In addition, to handle these widely scattered jobs, compaction equipment had to be moved rapidly along city streets.

Obviously, Union couldn't tow their sheepsfoot rollers behind crawler tractors over pavement. On the other hand, trailer transport, including loading and unloading delays, was slow and costly. Fifty-ton compactors also presented a a transport problem.

The machine chiefly used here was a Seaman-Gunnison Duo-Pactor, combining steel and rubber rolls in a single self-propelled unit. Although small in size—6 to 19 ton variable gross weight—this unit was able to produce densities comparable to that of larger compactors. And it had the additional advantage of being able to travel job-to-job under its own power in city traffic at speeds up to 18 mph.

● **There wasn't much room, but the Duo-Pactor easily made 180-degree turn on this narrow fill. Power plant of the machine is a standard International Model 350 Utility industrial tractor, modified as a two-wheel prime-mover. (Fuel consumption seldom exceeded two gallons an hour.)**

As a test of its compacting ability, the machine was pitted against a 40-in. sheepfoot roller on a fill made of river bottom clay. In this test, the machine's steel roll was lowered slightly on the first two passes, just enough to crush large clods. Then, two passes were made with just the eight small-diameter tires. A final pass was made with the steel roller.

Then, the sheepsfoot roller was brought in. Pulled over the completed test strip, the 2-in. feet indented only ¼ in.—hardly enough to see the tamper feet marks.

A typical assignment for the duo unit was a three-block-long trench 20 ft. deep and only 9 ft. wide. Earth was laid down in lifts of one to two feet. The ramps at each end of the trench were on 30 percent grade. Yet the packer maneuvered without difficulty in the narrow trench and easily climbed the steep grades. The owners say that on this particular job the unit saved the

cost of an air compressor, three tampers and four men.

It also saved money through the elimination of at least one conventional towed compactor. By doing the work of larger, more expensive equipment, said Union's project manager Don Adams, the machine released a large crawler tractor for other, more productive work suited to its size and power. Altogether, Union Building and Construction Corp. put the unit on four major assignments:

1. Testing subgrades and bases before fill was put down.
2. Compacting the earth fill in 6 to 12-inch lifts.
3. Compacting granular fills.
4. Compacting crushed stone base courses.

Another important task was the use of the steel roll to keep the fill smooth. Each day's fill was compacted and rolled smooth with the steel roll before stopping for the night. This helped water to run off the dense, smooth surface as fast as it fell, and reduced waiting time after heavy rains.

The Niagara Thruway is being built primarily to carry traffic to Niagara Falls. It starts east of Buffalo at the "Triple Interchange" where the Ontario Thruway joins with the Erie Thruway (now under construction), goes through the city of Buffalo and stops at the Niagara city line. Through most of the city it will provide local traffic with a six-lane freeway. John Powers is the state project engineer.

Chemical Stabilization Data Released by Monsanto

Use of phosphoric acid as a soil stabilizing agent in construction projects may overcome problems of heavy clays. So states an announcement by the research department of Monsanto Chemical Company's Inorganic Chemicals Division.

"Chemical stabilization of highway subgrades and base courses seems to hold great promise for development in the near future," said M. J. Scott, assistant director of research for the division, who pointed more specifically to the increasing need for additives to alter soil properties.

Clay soils, when dry, exhibit exceedingly high bearing strengths and would be suitable for subgrade or base course construction. When wet, however, the soil structure expands considerably and much, if not all, of the bearing strength is lost.

Monsanto experiments have shown that if two percent of phosphoric acid is added to a fat plastic clay and the material compacted, a hard, durable mass is produced that will withstand prolonged exposure to water and to wintering. When a second material, such as Monsanto's Amine ODT, is added, an even more stable soil results.

In laboratory evaluation of this new soil treatment, test cylinders (2 in. diam. x 4 in.) were compacted from "problem" soils. Testing consisted of immersing the specimens in water for 48 hours, draining briefly, measuring and breaking in unconfined compression. Other tests included volume-change measurements. Untreated soils either slaked or failed completely; the same soils, treated with two percent phosphoric acid and cured five days, had an immersed strength of 110 psi and less than one percent volume change, Scott said.

Several dozen test cylinders were buried outdoors through a New England winter and spring. Untreated cylinders were reduced to a soft, mushy consistency, while the phosphoric acid treated samples resisted the exposure and gave strengths comparable to the immersed strengths found in the laboratory test cylinders.

No major difficulties are foreseen in the field application of this method of soil stabilization, according to Scott. Generally, the construction procedure would be similar to the methods now employed with present commercially available stabilizers. The treatment of soil with phosphoric acid appears to hold several economic advantages over conventional methods, including lower storage, hauling and processing costs.

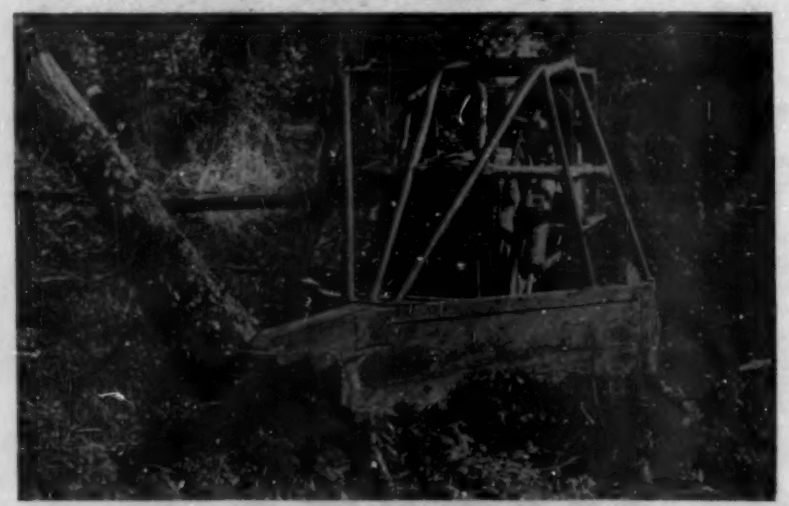
In an effort to demonstrate more fully these and other points, Scott said, Monsanto is conducting further laboratory investigations in close cooperation with several state highway departments.

"County Road Management"

The National Association of County Engineers has developed a work program intended to aid in improving the broad field of county road management. Details of this plan were presented in July at a joint meeting of county engineers and county officials.

Since that meeting, many road officials have expressed interest in this plan and have requested copies. In response to this demand and with the hope that the program will be of immediate benefit to many counties, the step-by-step plan has been presented in a booklet, "County Road Management." A copy is available free on request to the Association, 1721 DeSales St., Washington 6, D. C.

New High Speed Land-Clearing Blade



Down go the trees before the onslaught of this formidable-looking instrument of destruction—a Wicker land-clearing cutting blade mounted on an International TD-18 crawler tractor. Owned by C. R. West, Marianna, Arkansas, the implement is shown as it works on timberland on his 1,700-acre Double-Bar-Ben Plantation farm. The double-edge blade, capable of making 12-in. cuts, is felling trees of 24-in. diameter. In addition to land clearing, West uses the crawler for drainage, soil conservation and other uses.

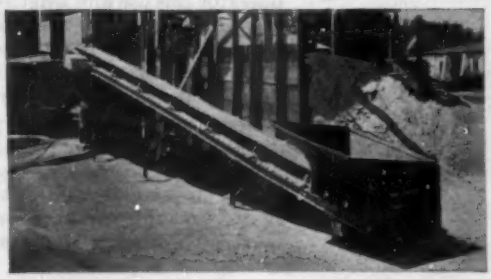
LONG HAUL—Even the longest Barber-Greene Conveyors are built of standardized components . . . produced on a precision, quantity production basis. They can be assembled in almost limitless combinations to cut the time and cost of any material handling job.

Long or short haul—it costs less to move materials with belt conveyors

Thousands of installations—ranging from a few feet to thousands of feet—prove that belt conveyors move bulk material at lowest cost.

No other machine is so simple in construction or requires so little maintenance. No other machine can deliver such high hourly capacities with so little power or attention.

Barber-Greene has given a new meaning to belt conveyor economy. Built of standardized components, Barber-Greene Conveyors are delivered sooner . . . require less engineering . . . are erected faster . . . give top performance . . . and are more easily altered to meet changing or expanding requirements. Being standardized, repair parts are readily available—usually from the stock of your local distributor.



SHORT HAUL—Even the shortest Barber-Greene Conveyors are available in standardized components in the width and length to suit your needs. These small conveyors provide the economical way to handle the widest range of materials with greatest flexibility.

56-7-PE

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

. . . for more details circle 239 on enclosed return postal card

*P. M. = Pressure Metering

Applying bitumen through 2 feet of spraybar as shown may not appear unusual or different, but when the operator can use any length—from 1 to 24 feet—*without changing the pressure* and *without any application adjustment whatever* . . . then there's a difference. It's *Rosco's Pressure Metering Method* that makes that difference.

The P. M. method of applying bitumen is *not* metered by the bituminous pump, nor is the amount of discharge measured in relation to the pump revolutions. Normal wear of the pump and occasional, unavoidable nozzle clogging never affect the application rate. Here again, Pressure Metering *makes the difference* . . . the rate is automatically maintained by Rosco's P. M. system.

It is this Pressure Metering Master Valve, the "heart" of Rosco Distributors, that gives you this built-in control of pressure which is the only accurate method of obtaining precise bituminous application. This is the valve that also directs the flow of material for all of the Rosco Distributor functions.

Make the difference pay off. Let your Rosco dealer show you how. Write the factory for descriptive bulletins with specifications of Distributors with P. M.

. . . for more details circle 279 on enclosed return postal card

New Products

(Continued from page 111)

GMC Trucks for 1958

GMC Pickup

New style developments are announced by the Truck and Coach Division of General Motors Corp., 13400 W. Outer Drive, Detroit 28, Mich.

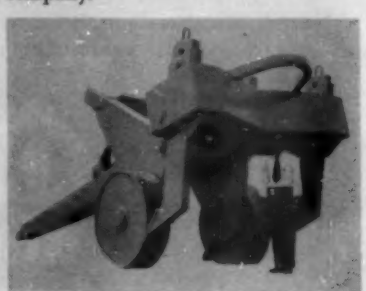
Chief among the mechanical improvements is the introduction of Allison Torqmatic transmission in place of the Hydra-matic in models 370 and up through 600 (weight ranges 32,000 to 55,000 lb. GVW). Hydra-matic is retained on ½ to 2 ton models.

A new 336-cu-in. V-8 gasoline engine heads up a group of 9 gas and diesel engines. A valve-in-head 90 degree V-type, it develops 200 gross horsepower at 440 rpm and a gross torque of 307 pound-feet at 2,000 to 2,400 rpm. Compression ratio is 7.5 to 1.

For more details circle 123 on Enclosed Return Postal Card.

25,000 lb. Heavy Ripper

A new, 25,000 lb. wheel-type drawn ripper, announced by Southwest Welding and Manufacturing Co., Construction Machinery Division, 3201 W. Mission Rd., Alhambra, Calif., has structural features to withstand the most severe job conditions, according to the company.



Southwest RXH-3 Ripper

The Southwest RXH-3 has box beam sections of special design. Wheels are

(Continued on page 139)

In Earthmoving, Over-All Job Efficiency is a

Lot of "Little" Efficiencies

How efficiency tends to be whittled down by a combination of factors, each seemingly minor—and how a small percentage of improvement "all along the line" will add up to a substantial production increase.

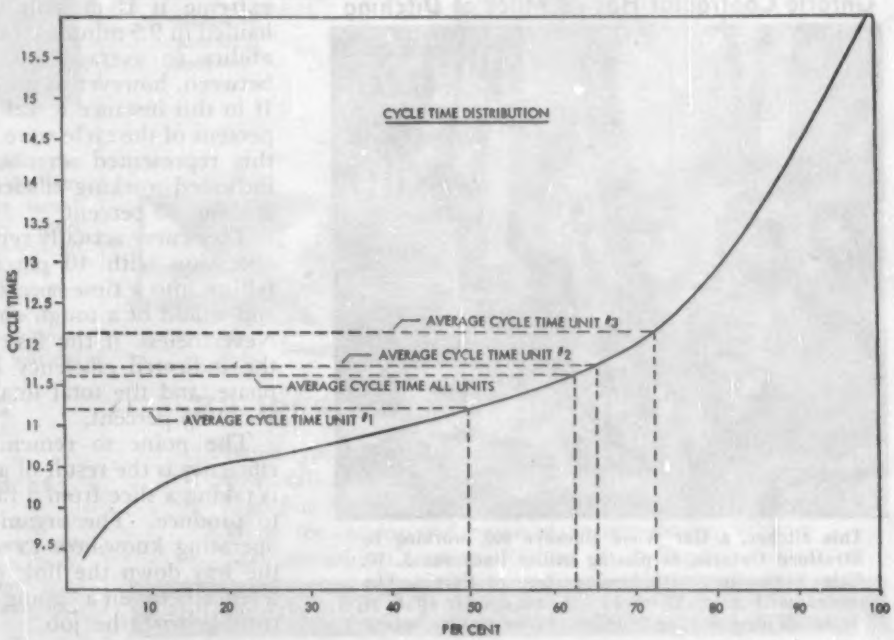
D. K. Heiple
Chief Field Engineer, LeTourneau-Westinghouse Company.

THE MEASURE of a machine, a plant, a man, or a dirt moving job is *efficiency*. Some of these are easy to appraise, others difficult. The elements that go into the total make-up of a construction project are not only often difficult to predict, but when added together can combine to a rather staggering total.

As a 100 percent starting point the contractor has a given number of working days in any calendar period. The first efficiency he faces is one of delays to either all or part of the operation, because of items he can perhaps anticipate but involve difficulty in controlling. These include weather, preceding construction or engineering not finished on schedule, absenteeism on the part of the crews, etc. The efficiency of any of these factors may vary from almost nothing for short periods up to 50 percent or more in an extremely wet season. To see how a total project can suffer, let us assign 10 percent to these causes as a starter and look further.

• BREAKDOWN. In the 90 percent time remaining, the equipment spread—whether scrapers and push tractors, truck and shovels, or paving layout—is subject to mechanical breakdowns. Some of these may overlap in the repair time with weather or other downtime, but an extra loss of 5 percent to 15 percent, depending upon condition of equipment, maintenance program, and job conditions, may well be anticipated. If this is only 5 percent, the total efficiency is still down to 85.5 percent (90 x 95).

• "50 MINUTE HOUR." Next, a big bite comes in what is known as the 50 minute hour. This factor



• Diagram referred to in accompanying article showing how the poor efficiency of some units offsets the good performance of others—a circumstance which must always be foreseen in job planning.

● How many yards per day from these scrapers? The skill and zeal of the operator are one of a dozen factors.

is simply the recognition that over a period of time an equipment operator and the conditions of a job seldom combine to produce more than 50 actual working minutes out of 60. Although 55-minute efficiency is sometimes recorded, a range between 40 and 50 minutes out of 60 is usually encountered. Complete balance of hauling to loading units is difficult if not impossible; result: some waiting at cut or fill, units sometimes bog down, operators stop for a drink, instruction, or a breather.

This factor result can be measured by checking a load count for a given period and comparing it against the average of cycle times for the same period on all the uninterrupted cycles. For example, if units can average 4-minute cycles, the indicated load count would be 15 per hour per machine. A 2-hour load count simultaneous with timed cycles showing 25 loads actually hauled would be at a 50-minute hour, or $\frac{25}{30} = 83$ percent efficiency. Total efficiency at this point is down to 70.9 percent (85.5 x 83).

● CYCLE TIME. Still another, but not so easily defined efficiency takes an additional toll. This factor is the difference between the average hauling cycle and some shorter cycle or faster production rate which might be achieved. The graph illustrates how cycle times may vary on a given haul with three scrapers working. In this case the longest cycle time was 16 minutes and the shortest about 9.5 minutes. The average load, haul, spread and return cycle for each machine is marked separately and the combined average also shown.

To use the graph, read the over-all average point to the left-hand scale, which shows a cycle time of 11.6 minutes. Reading down from the same point on the curve to the percent scale at the bottom shows that of all the loads hauled, 63 percent were on shorter cycle times than the average.

It would also show for comparison that unit No. 3 averaged 12.15 minute cycles, and about 73 percent of all loads hauled were faster than this individual machine's average.

The efficiency problem here is a more difficult one. But it is possible to read up from the bottom scale at 50 percent and across to 11.2 minutes and say—assuming one machine can average this time, and half of all loads hauled are faster—that all units might well have the same average. At the extreme it is difficult to believe that one load hauled in 9.5 minutes constitutes any demonstrated ability to average 9.5 minutes. Somewhere in between, however, is an attainable higher average. If in this instance it was determined that, since 30 percent of the cycle were faster than 10.85 minutes, this represented an obtainable figure, then the indicated working efficiency at the average shown is about 93 percent.

This curve actually represents a smooth running operation with 40 percent of the loads hauled falling into a time spread of 10.5 to 11.5 minutes, and would be a tough one to change substantially. Nevertheless, if the faster cycle is practical, then the indicated efficiency is at 93 percent for this phase, and the total finally becomes 70.9 x 93 or about 66 percent.

The point to remember is that over-all job efficiency is the result of a number of factors. Each is taking a slice from a rapidly declining potential to produce. The organization that combines its operating know-how to save a percent or two all the way down the line, can well achieve the difference between a "going concern" and one having trouble with the job.

Ontario Contractor Has 78 Miles of Ditching

This ditcher, a Gar Wood Buckeye 403, working in Stratford Ontario, is placing utility lines for J. W. Cain, contractor, with headquarters at Sarnia. The contractor is using 17 trucks and four similar ditchers to install pipe totaling 78 miles in four Ontario cities.

New Products

(Continued from page 136)

drum-type, mounted on Timken bearings. All rotating parts are designed for easy lubrication. Ripping depth is controlled through the cable and is quick and positive.

This ripper has an overall length of 25 ft., a width of 10 ft. 8 in. and a height of 8 ft. 10 in. It is designed for three depths of penetration, 36 in., 42 in. and 48 in. A special center shank can be furnished to give maximum penetration of 60 in.

For more details circle 124 on Enclosed Return Postal Card.

Deep Tread on Truck Tire

A truck tire designed to provide greater tread life and increased traction is being marketed world-wide by The Goodyear International Corporation, Akron, Ohio. Labeled the "Hi-Miler Cross Rib," the new tire is constructed of nylon fabric.

New Goodyear Tire

Features of the tire, according to the manufacturer, include: a 60 percent deeper tread, providing better mileage, particularly in drive wheel use; angled traction bars cross-wise to the tread giving increased traction in all directions; submerged circumferential ribs buttressing the shoulders to reduce scuffing action and uneven wear; and wide, open grooves which will not hold stones.

For more details circle 125 on Enclosed Return Postal Card.

Fork and Platform Trucks

A new, broadened line of materials handling equipment has been announced by Pettibone-Mulliken Corp., Materials Handling Equipment Division, 4700 W. Division St., Chicago 51, Ill.

Getting TRAFFIC-SAFE Pavements

is your basic Winter-Time problem

You can get those **Traffic-Safe driving conditions Faster** and Cheaper if you use the **"Scotchman" Method** of Ice and Snow Control . . . spread de-icing salts Early, Thin and Wide.

You can salt-treat your pavements **8 times Faster and 50% Cheaper** with a stainless steel "Scotchman". Choice of 3 models to use on any dump truck or pick-up . . . no complicated hook-ups. One man Cab Control is optional.

EXCLUSIVE features: 1. **Cartridge-type Power Unit** . . . engine, impeller and electric starter in a single, compact unit—removed or installed in 5 minutes; 2. **Accurate Controls** . . . of rate of spread, of direction and width of spread; 3. **Stainless Steel** . . . all sheet metal touched by salt. For details and demonstration see your "Scotchman" dealer or write to us.

Nothing Saves Like a "Scotchman"

TARRANT Manufacturing Company

25 Jumel Place, Saratoga Springs, N. Y.

. . . for more details circle 305 on enclosed return postal card

White

NEW ASPHALT PLANT

$13,500 (f.o.b. factory)

Model L-10 portable or stationary

20 tons per hour hot mix capacity

Batch type 1000 lb. pug mixer with air-controlled gates. Has built-in asphalt heating kettle, reciprocating plate aggregate feeder. 50 hp engine or 30 hp electric motor. Write for catalog and name of nearest dealer. White Manufacturing Company, Elkhart 2, Indiana.

ONE MAN LOADS . . . ONE MAN OPERATES!

. . . for more details circle 296 on enclosed return postal card

Additions to the Pettibone Mercury line include an advanced series of gas powered, pneumatic tired fork trucks with a capacity range from 1,500 to 5,000 lb. Heavier models are also scheduled.

Expansion of the electric powered line of fork and platform trucks is under way and will include electric fork trucks in 1,000 and 10,000 lb. capacities. New models in stand-up rear control and stand-up center control types are also included.

For more details circle 126 on Enclosed Return Postal Card.

700-Plan Vertical File

For organizations with small-size print filing requirements and floor space problems, a new all-steel, modular vertical file has been placed on the market by Momar Industries, 4323 W. 32nd St., Chicago 23, Ill.

The "Glider 700" blueprint rack accommodates 700 plans in sizes up to 24 x 36 in., stands 48 in. from the floor and has outside dimensions of 24 x 24 in. Seven retainers, available in 18 and 24 in. lengths, held 100 prints each. They incorporate a triple thumb screw clamp-design that "pressures" prints in filing position. This obsoletes punching holes in prints as in home-made units.

Momar "Glider 700" File

For more details circle 127 on Enclosed Return Postal Card.

48-in. Long Truck Tractors

A new line of International cab-over-engine truck tractors with 48-in. bumper-to-back-of-cab dimensions has been placed in production by the motor truck division of International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

International Truck Tractor

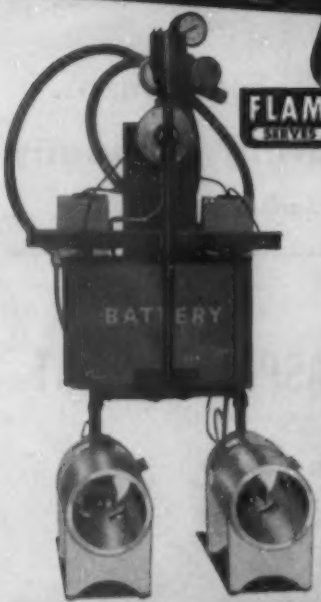
Named the "Sightliner" models, these new trucks are offered in the ACO-190, -200 and -220 series, are available in gross vehicle weight ratings from 24,000 to 30,000 lb., and come in 5 wheelbases: 98, 104, 116, 128 and 140 in. They are powered by International heavy-duty V-8 gasoline or LPG engines and will soon be available with diesel power.

For more details circle 128 on Enclosed Return Postal Card.

Control for Heliwelding

A weld-cycle control unit designed to provide programmed control of all functions of machine Heliwelding has been announced by Airco International, a division of Air Reduction Co.,

FLAMEGAS INTRODUCES NEW ASPHALT & TAR KETTLE BURNER



SPEEDS UP WORK

SAVES YOU MONEY

OPERATES ON PROPANE (LP) GAS

BURNERS GUARANTEED

- Speeds up heating of tar, asphalt and pitch.
- Compact, portable unit available with single or multiple burners.
- Burner operates on 6 or 12 volts, an electrical system or stand-by battery.
- Easily mounted and transported. No downtime, always operates.
- 2000° temperature—no soot, no carbon, no flues to clean.
- No messy oil drums, to collect refuse or water, or topple over.

Flamegas ASPHALT and TAR KETTLE BURNER speeds up heating. After burner is lit, set controls operate with complete safety. You're set to go when your work crew arrives.

FLAMEGAS DETROIT CORP.
12901 Auburn Avenue • Detroit 23, Michigan

. . . for more details circle 262 on enclosed return postal card

SWENSON SPREADERS
FOR ICE CONTROL

SPREADS SALT 200 LBS. PER MILE OR IN ANY DESIRED AMOUNT
Lays a Narrow Strip or Full Traffic Lane

Handles all granular materials — salt, cinders, sand, calcium chloride, rock chips. Spreads at speeds up to 30 M.P.H. Clutch-controlled flow: steady or intermittent for hills and intersections.

Write for complete information

SWENSON SPREADER & MFG. CO.
LINDENWOOD, ILLINOIS

. . . for more details circle 284 on enclosed return postal card

Inc., 150 E. 42nd St., New York 17, N. Y.

The unit consists of a main panel which contains all adjustable mechanisms and a push-button remote control station. This system is for use with high-frequency current and DC straight-polarity welding power from a saturable-reactor-controlled rectifier-type supply. Designed for applications requiring precise weld timing and crater filling on repetitive circumferential or longitudinal welds, it simplifies the Heliwelding of items such as canteens and transistor cases.

For more details circle 129 on Enclosed Return Postal Card.

Dodge Trucks for 1958

Increased power, novel styling, greater load capacities, added driver comfort, larger brakes and new automatic transmission are among the features of 1958 Dodge trucks. There are 10 different engine ratings, ranging from 113 to 234 hp. Maximum gross vehicle weights are from 5,100 to 46,000 lb. and gross combination weights range up to 65,000 lb.

Dodge "Alligator Hood"

Other features include the "hill retarder" in the Torqmatic transmission, a safety device that assists downhill braking and lengthens brake life; the "alligator hood," opening upright to a full 90 deg. and new full width for the first time; "full-traction" differential, available for the rear axle of all D100 models and for front and rear axles of W-100 models. Increased road clearance on the low-tonnage trucks aids off-highway driving and is of particular value on secondary or rutted roads.

For more details circle 130 on Enclosed Return Postal Card.

Compact Megaphone Unit

Coordination of vehicles and personnel in construction and other activities under all weather conditions is the function of the "Power Voice" megaphone brought out by Motorola, Inc., Communications and Industrial Electronics Division, 4501 W. Augusta Blvd., Chicago 51, Ill.

Motorola Megaphone

Fully transistorized for minimum battery drain and highest efficiency, the unit is completely self-contained. Detachable microphone, amplifier, batteries and speaker are all in one 8-lb. case. Effective range varies from ¼ to ¾ mile depending upon ambient noise level. The unit is ordinarily held to the mouth by its pistol grip handle or slung from the shoulder with an attached carrying strap and used with its detachable microphone. Primary power comes from standard flashlight cells or through an adapter from any external source of 12 or 6 volts DC.

For more details circle 131 on Enclosed Return Postal Card.

Backhoe Operator Sees Job

Maximum working visibility is featured in the Davis backhoe, a product of Massey-Harris-Ferguson Industrial Division, Wichita, Kans. The seat turns with the boom, so that the operator always faces his work when digging or loading trucks, and because of his high position on the frame, he can also watch the digging process directly.

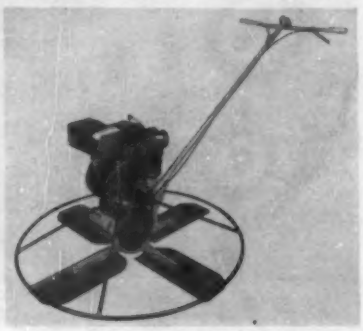
Davis Backhoe

The backhoe is available in two models: the "210," with a rotary boom swing cylinder that provides 200 deg. of continuous operating arc and which can be side mounted for flush digging alongside an obstruction, and the "185," with conventional swing cylinder. Other features claimed are 10,000 lb. breakaway power and exclusive vertical type stabilizers.

For more details circle 132 on Enclosed Return Postal Card.

"Dead Man" Trowel Control

A "dead man" clutch control lever for "Con-Trow'l" models 360-G and 440-G has been introduced by Champion Mfg. Co., 2028 Washington Ave., St. Louis 3, Mo.



Champion Trowel

A feature of the machine is that it disengages the clutch assembly and stops trowel blade rotation the instant the operator releases the lever mounted on the handle—thus preventing accidents resulting from a "runaway" machine—but does not stop the engine. Trowel rotation can be resumed simply by depressing the lever.

For more details cricle 133 on Enclosed Return Postal Card.

Reflective Glass Bead

Flex-O-Lite Manufacturing Corp., St. Louis, Mo., has introduced its new #831 improved reflective glass bead for application to traffic signs, street name signs, and license plates.

This glass bead is claimed to make possible white and yellow signs with better reflectivity and message legibility. Applied at economical cost by conventional methods and given a protective covering of Flex-O-Lite "Stormcote," the signs are said to be weather, water, dirt and wear resistant. Complete angularity of the #831 bead provides legibility up to the point of passing. Surface glare is avoided without "dead" spots.

Available in all standard sizes for application to traffic signs, the #831 bead is also manufactured in extra-fine grade for street name signs and license plates.

For more details circle 134 on Enclosed Return Postal Card.

● The Bucyrus-Erie crane has a 10-ton lifting capacity, handles boom lengths from 25 to 70 ft. plus jibs.

New Transit Crane-Excavator

Low cost maintenance, versatile crane-excavator service, and fast, rubber-tired mobility are some of the advantages describing a new model transit crane being introduced by Bucyrus-Erie Company, South Milwaukee, Wis.

The model 11-B is designed simply and compactly, according to the manufacturer's release. Readily convertible from a 10-ton lifting crane to a dragline, clamshell, hoe or shovel, the unit is mounted on a 6-wheel drive carrier, providing speeds up to 47 mph.

The 11-B features a new two section cab—one for the operator, the other covering the main machinery and power plant and featuring sliding doors and hinged and removable panels for easy access to main machinery.

Designed as a unit assembly, the new swing circle features a double row of ball bearings in place of swing and hook rollers generally used. Sealed and pre-lubricated, it is welded directly to the carrier and bolted on the underside of the revolving frame. The listed advantages: low friction, high load bearing capacity, low maintenance, and reduced play between upper and lower works.

The manufacturer has used nylon pins and bushings in the control lever system, eliminating the need for lubrication. Main machinery is flood lubricated—all gears (except the swing pinion and gear) are enclosed and run in oil. In addition, all moving parts of main clutches and all power-transmitting parts on the revolving frame are mounted or turn on anti-friction bearings.

● The new unit shown converted to shovel work.

For more details circle 133 on Enclosed Return Postal Card

Retractable Boiler Nozzle

Cleaver-Brooks Nozzle

One of the latest devices to be incorporated on the Model CB boilers of Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12, Wis., in a single tip retractable nozzle that simplifies cleaning of the burner nozzle.

While the idea of a single tip nozzle is not completely new, this design is equipped with flexible lines which allow the nozzle to be inspected without removing any bolts. The single tip nozzle offers more stable combustion and more positive mixing of oil and air, and is fully retractable on model CB boilers, 60 hp and larger. A small vise conveniently located on boiler head is used to remove the tip quickly and easily. On combination oil-gas fired models, the nozzle can be withdrawn from gas firing position to bring it out of the radiant heat zone. This prevents vaporization of oil which may still remain within the nozzle.

For more details circle 136 on Enclosed Return Postal Card.

Crane and Excavator

A low-cost crane and excavator unit which mounts on a conventional truck chassis is offered by Sherman Products Co., Royal Oak, Mich. It uses a standard Ford industrial model "E" power unit and many standard truck parts, is claimed to lift 4 tons, and can serve as crane, trenchhoe, dragline and clamshell.

Sherman Crane

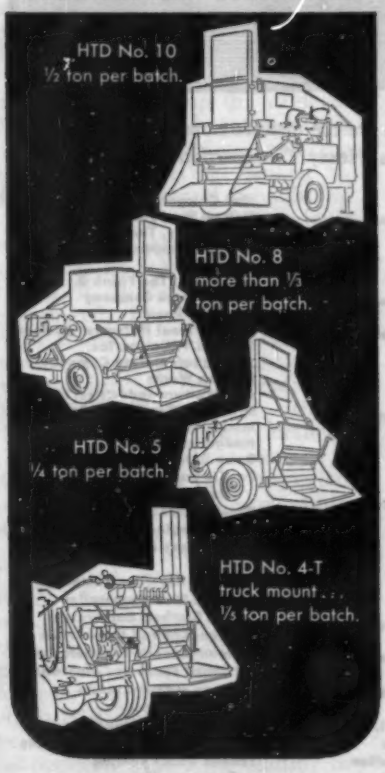
For more details circle 137 on Enclosed Return Postal Card.

Redesigned Pipe Detector

Improved internal construction of the Detectron pipe detector, manufactured by Computer-Measurements

FOR LOW-COST
HOT OR COLD
PAVING OR PATCHING
IN ANY SEASON

McConnaughay
ASPHALT MIXERS



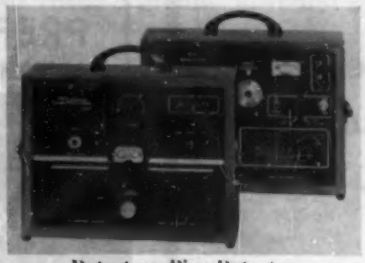
For details and specifications write . . .

McCONNAUGHAY MIXERS, INC.
LAFAYETTE, INDIANA
National distributors: Asphalt Equipment Co.
3314 Cherry Lane, Fort Wayne, Indiana

For more details circle 272 on enclosed return postal card.

Corp., 5528 Vineland Ave., Dept. 99, North Hollywood, Calif., has resulted in easier and more accurate use of the instrument and reduces greatly the possibility of cutting unknown pipes with bulldozers and ditching machines, according to the manufacturer.

The new design produces a more stable field signal, which makes it possible to tune the instrument more sharply. This improves sensitivity, it is said, and allows easier "separation" of closely set pipes.



Detectron Pipe Detector

For more details circle 138 on Enclosed Return Postal Card.

New Sealing of Bearings

Timken Sealed Bearing

A new approach in the sealing of tapered roller bearings has been developed by The Timken Roller Bearing Company of Canton, Ohio. Called the "Duo-Face" seal, it combines the features of the outside diameter seal and the face type seal. One lip operates in the bearing housing bore providing an outside diameter seal. The other lip operates against the smooth, flat, hardened and ground face of the bearing cup providing face type sealing.

The integral assembly, it is claimed, eliminates most of what is generally classed as conventional seal maintenance; and long life is said to be assured through a large initial supply of lubricant that can be replenished if necessary.

For more details circle 139 on Enclosed Return Postal Card.

BETTER LUBRICATION

FOR BALL AND ROLLER BEARINGS

BALL BEARING LUBRIPLATE . . . a most effective grease type lubricant that also protects ball and roller bearings against rust and corrosion. Highly recommended for speeds up to 5,000 RPM and temperatures up to 300° F.

LUBRIPLATE No. 205 . . . an unusually light consistency, grease type lubricant made for use in anti-friction bearings operating at speeds in excess of 5,000 RPM.

LUBRIPLATE Nos. 1, 2, 4 and 8 are fluid type lubricants of various viscosities that have given outstanding results in anti-friction oil type bearings. Nos. 1 and 2 are recommended for high speed applications; nos. 4 and 8 are recommended for slow speed, heavy load applications.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Write for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. LUBRIPLATE DIVISION, Fiske Brothers Refining Company, Newark 5, N. J. or Toledo 5, Ohio.

For more details circle 271 on enclosed return postal card.

here . . . without a doubt . . . is the most useful buying catalog in your office

. . . and here are some reasons why you should be USING IT DAILY!

- Catalogs are PREFILED — Saving you time and space required to file individual manufacturers' catalogs.
- Saves you the time and inconvenience of writing to manufacturers for catalogs.
- Gives you all the facts needed BEFORE you make a buying decision.
- Manufacturers' names and trade names indexed alphabetically for quick reference to individual catalogs.
- All the buying information is 'boiled down' — designed for your convenience.

After checking the advantages listed above, you can see why this ONE CATALOG offers you so MANY advantages . . . saving you both time and money, not only in the mechanical and physical aspects of a cataloging operation . . . BUT MOST IMPORTANT OF ALL . . . it is available WHEN you NEED it . . . BEFORE you make your buying decisions! The manufacturers represented in this catalog are literally 'meeting' with you in your office — offering you all the information you could possibly need concerning their products. Why not meet them at least half way — and USE THEIR PREFILED INFORMATION!

Here are the manufacturers represented in Gillette's Heavy Construction Prefiled Catalog:

Acker Drill Company, Inc.
American-Marietta Company
American Steel & Wire
Anthony Company
Armco Drainage & Metal Products, Inc.
Arrow Manufacturing Company
Austin-Western
Baldwin-Lima-Hamilton Corp.
Barber-Greene Company
Blaw-Knox Company
Briscoe Manufacturers of California
Bros Boiler & Mfg. Company, Wm.
Buffalo-Springfield Roller Company
Butler Bin Company
Carey Manufacturing Company, The Philip
Childers Manufacturing Company, Inc.
Chrysler Corporation
Clark Equipment Company
Cleaver-Brooks Company
Cleveland Formgrader Company, The
Cleveland Trencher Company, The
Colorado Fuel and Iron Corp., The
Concrete Sawing Equipment, Inc.
Construction Products Sales
Continental Motors Corporation
Cummer & Son Co., The F. D.
Cummins Engine Company, Inc.
Detroit Diesel Engine Division
Dart Manufacturing & Sales Co.
Erie Strayer Company
Flexible Road Joint Machine Company, The
Flintkote Company, The
Gar-Bro Manufacturing Company
General Motors Corporation
Gledhill Road Machinery Company, The
Goodall Rubber Company
Gunderson-Taylor Machinery Company
Harnischfeger
Heil Company, The
Heltzel Steel Form & Iron Company, The
Hensley Equipment Company, Inc.
Hough Co., The Frank G.
Huber Warco Company
Ingersoll-Rand
International Harvester Company
Jackson Vibrators, Inc.
Jay Manufacturing Company
Madsen Works
Mid-Western Industries, Inc.
Miller Tilt-Top Trailer Company
Minneapolis-Moline
Naugatuck Chemical
Owen Bucket Company, The
Pacific Car and Foundry Company
Phoenix Products Company
Pioneer Engineering Works, Inc.
Pippin Construction Equipment, Inc.
Presstite-Keystone Company
Republic Steel Corporation
Rogers Brothers Corporation
Seaman-Andwall Corporation
Seaman-Gunnison Corporation
Servicised Products Corporation
Shawnee Manufacturing Company, Inc.
Stow Manufacturing Company
Symons Clamp & Mfg. Company
Timken Roller Bearing Company, The
Toncan Culvert Manufacturers Association
Tampo Manufacturing Company
United States Motors Corporation
United States Rubber Company
United States Steel
United Steel Fabricators, Inc.
Viber Company
Waukesha Motor Company
White Instrument Company, David
Wickwire Spencer Steel Division
Wico Electric Company
Williams Form Engineering Corporation

New Publications

'Contract Method' Booklet Offered by the AGC

The construction industry, dedicated to the contract method of construction, now has available a revised and illustrated edition of a basic booklet, *The Contract Method of Construction Safeguards Public Funds.*

First published in November, 1948, by The Associated General Contractors of America, the booklet was reprinted seven times by May, 1957, and many thousands of copies were distributed to AGC members and other interested persons. The publication was used for nine years to inform public officials on local, county, state and federal levels of the many advantages of the contract method.

The original concept and the arguments pointing up the value of the contract method retained their validity over the years, and the first part of the revised booklet, although rewritten and brought up to date, follows the same basic outline in the section, "Advantages of the Contract Method":

Cost is guaranteed; quality is guaranteed; job is completed on time; competition (more for your money); proper planning is assured; responsibility is centralized; and business "know-how" is utilized through normal industry methods.

The remaining three sections in the original booklet were extensively expanded. The pamphlet now has six major sections.

The second section, "Industry Cooperation Provides Additional Benefits," points out that there are hundreds of fine contracting firms throughout the United States capable of doing excellent work; however, when contracts are awarded to AGC members, "owners can benefit most directly from AGC's cooperation with other leading organizations in—or associated with—the construction industry, and government contracting agencies."

The section discusses AGC cooperation with government agencies, with many other national business groups (such as the societies and associations of architects, engineers, specialty contractors and public works officials); and with labor groups, through the National Joint Board for the Settlement of Jurisdictional Disputes and national joint apprenticeship committees.

Copies of this pamphlet are available from the AGC office, 1227 Munsey Building, Washington 4, D. C.

BUILDING YOUR SUPER HIGHWAYS. By George Zaffo. Garden City Books, Garden City, N. Y., 1957. 64 pages. Price $2.50.

In this colorfully illustrated book, described by the publisher as a "manual for young sidewalk superintendents," author-artist George Zaffo follows the work of contractor Edward J. Petrillo and his men as they build a super highway. Every step of the process, beginning with the removal and relocation of buildings, is demonstrated with detailed pictures of the equipment in action.

Although intended primarily for children, *Building Your Super Highways* should appeal to any lay reader who wants an over-all view of roadbuilding methods unburdened with technical detail.

AUTOMOBILE FACTS AND FIGURES, 1957 EDITION. Compiled by the Automobile Manufacturers Association, 320 New Center Bldg., Detroit 2, Mich., 80 pages.

Data on many phases of motor vehicle production, sales, registrations, importing and exporting, parts sales, highways, taxes, employment, traffic safety and vehicle operators are contained in the annual statistical handbook of the AMA. The many tables and attractive charts are well indexed.

PROCEEDINGS OF THE 43RD ANNUAL ROAD SCHOOL. Engineering Bulletin Vol. XLI, No. 3, Extension Series No. 92. Compiled and edited by Ben H. Petty, Purdue University, Lafayette, Ind. 221 pages. This bulletin consists of papers presented at Purdue's Road School by both Indiana and out-of-state engineering experts. The subjects cover highway construction and maintenance, traffic safety and training for engineers.

SAFETY SLOGANS FROM EVERYWHERE, FOR EVERYONE is a flyer containing more than 1000 slogans to fit every safety situation including traffic safety. For a copy address the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill. The price is 65c ea. in quantities from 1 to 9, 40c ea. up to 99, 35c ea. up to 1000 and 30c ea. in larger quantities.

COUNTY ROAD MANAGEMENT; a STEP-BY-STEP PLAN OF IMPROVEMENT. A 16-page booklet by the National Association of County Engineers, 1721 DeSales St., Washington 6, D.C. This pamphlet outlines the development of a plan for the management of county roads, intended for the benefit of officials and management bodies.

AMERICAN TRUCKING TRENDS. A 30-page bulletin prepared by the Department of Research, American Trucking Associations, Inc., 1424 16th St., Washington 6, D. C., giving pertinent statistics on the steadily growing trucking industry.

THE EARTH CHANGERS, by Neill C. Wilson and Frank J. Taylor. 308 pages. Price $5.00. Doubleday & Company, Inc., 575 Madison Avenue, New York 22, N. Y. A layman's review of the development of earthmoving, containing accounts of some of the world's great projects.

STATISTICAL ABSTRACT OF THE UNITED STATES; NEW EDITION 1957. Over 1,100 tables picturing current facts about American industry and national life. Compiled by the Bureau of Census. Available at $3.50 per copy through Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. or from the U. S. Department of Commerce Field Services Offices in any principal U. S. city.

MATHEMATICS FOR SCIENCE AND ENGINEERING. By Philip L. Alger, widely known electrical scientist. 360 pages. Price $6.95. McGraw-Hill Book Co., Inc. 330 W. 42nd St., New York, 36, N. Y.

This book contains most of the mathematical procedures and methods which any engineer or technician will need to use in the course of his career.

BITUMINOUS PAVING MIXTURES. Bulletin No. 160 of the Highway Research Board consists of two papers presented at its 36th annual meeting: "State Practices in the Use of Bituminous Concrete," by W. E. Chastain, Sr., Illinois Division of Highways; and "Foamed Asphalt in Bituminous Paving Mixtures," by Ladis H. Csanyi of the Engineering Experiment Station, Iowa State College. Price is $2.40 from the HRB, 2101 Constitution, Washington, D. C.

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New York City
HOTEL New Yorker
34th Street at 8th Avenue
Manhattan's largest and most conveniently located hotel. 2500 outside rooms, all with bath and free radio, television in many. Direct tunnel connection to Pennsylvania Station. All transportation facilities at door. Three air-conditioned restaurants
LAMP POST CORNER . . . COFFEE HOUSE
GOLDEN THREAD CAFE
Singles from $7 | Doubles from $11 | Suites from $23
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• GALLUP, N.M. Hotel El Rancho
• ALBUQUERQUE, Hotel Franciscan
• DENVER, COLO. Hotel Park Lane
• WASHINGTON, D.C. Hotel Raleigh
• HARTFORD, CONN. Hotel Bond
• PITTSBURGH, PA. Hotel Sherwyn
• CINCINNATI, O. Hotel Sinton
• NEW YORK CITY Hotel New Yorker
• HONOLULU Hotel Waikiki Biltmore
World-famed hotels
Teletype service—Family Plan

Manufacturers' Literature

INTERNATIONAL HARVESTER CONSTRUCTION EQUIPMENT (folder CR-694-G) issued by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., provides a quick reference sheet for the company's entire line of construction products. Every unit and attachment is covered by description, picture and short specification. Among the items are the crawler tractor line, Payscraper units, the Drott Skid-Shovel, the 4-in-1 bucket line and the towed scraper line. The folder also offers information on the latest additions to the carbureted power unit line, the V-8 units UV-549, UV-401, and UV-461.

For more details circle 140 on Enclosed Return Postal Card.

BLACK TOP MOVIE AVAILABLE. Richfield Oil Co. has sponsored a ½ hour film showing asphalt pavement construction and paving plants in and around Los Angeles. Reels are available on loan to groups interested in road building, from Industrial Asphalt, 1100 South Beverly Drive, Los Angeles 35, Calif., and from Standard Steel Corp., 5001 S. Boyle Ave., Los Angeles 58, Calif.

For more details circle 141 on Enclosed Return Postal Card.

RAYMOND CONCRETE PILE CO., 140 Cedar St., New York 6, N. Y., has recently published a brochure entitled "Raymond Cylinder Piles of Prestressed Concrete."

The 20-page catalog, available upon request, describes and illustrates the manufacture and economic applications of prestressed concrete cylinder piles and related products. Information is given on the merits of prestressed concrete cylinder piles for foundations of bridges, waterfront and offshore structures. Numerous photographs of installations and drawings of suggested designs are shown.

For more details circle 142 on Enclosed Return Postal Card.

BORALLOY, an 8-page booklet (Form No. DE 739) available from the Advertising Division, Caterpillar Tractor Co., Peoria, Ill., describes the manufacture of the new Boralloy sprockets for Cat D8 and D9 tractors, which are stated to wear twice as long.

Other new brochures from Caterpillar include "Caterpillar Spark-Ignition Engine," outlining the wide application of these recently-introduced units, and "Your Opportunity—Aggregates for Highways Ahead," which deals with the coming heavy demand for aggregates because of the federal-aid program.

For more details circle 143 on Enclosed Return Postal Card.

U.S. STEEL FILMS FOR LOAN. Picture and sound films of interest in the road and allied construction fields are available to appropriate groups as loans from United States Steel Corp., among the subjects are "Speaking of Wire Rope," "The Cantilever Bridge," "The Suspension Bridge" and 15 other subjects.

For more details circle 144 on Enclosed Return Postal Card.

B. F. GOODRICH INDUSTRIAL PRODUCTS Co., Akron, Ohio, has issued a new

IN NEW YORK
43rd St. just West of Broadway
1000 rooms with radio and MUZAK from $3.75
AIR CONDITIONED TELEVISION
HOTEL TIMES SQUARE
45th Street East of Broadway
400 fine rooms from $4
TELEVISION AIR-CONDITIONED
HOTEL KNICKERBOCKER

Winter Fun is King
at The KING'S GATEWAY
Thrill to a winter wonderland weekend or full vacation..
EVERYTHING TO DO
Ice Skating (Instruction available) • Skiing—3 Ski Tows Operating Daily (Instruction and all necessary equipment available) • Snowshoeing • Tobogganing • Ski-Joring • Sleigh Riding • Hunting • Ice Fishing
EASY TO REACH
On U.S. 45 on the Wisconsin-Upper Michigan Border at Land O'Lakes, Chicago & North Western R. R. offers Pullman Service to Land O'Lakes—overnight from Chicago and Milwaukee.
Write for information or reservations.
MUSIC • DANCING • ENTERTAINMENT
KING'S GATEWAY HOTEL and INN
Land O'Lakes WISCONSIN
Phone 261

catalog sheet describing how Amorite is used as a liner, curtain, throw mat or pad for protection against abrasives. In addition to outlining specifications, it claims that Amorite outwears steel 10 to 1 in installations such as chutes and hoppers.

For more details circle 145 on Enclosed Return Postal Card.

ATTACHMENTS (Form DE 754), a 2-color brochure available from Advertising Division, Caterpillar Tractor Co., Peoria, Ill., lists many of the tools offered by Caterpillar for its equipment. Liberally illustrated, the booklet shows attachments for crawlers, wheel units, Traxcavators and motor graders. A special list is included to help select the proper tool for the particular operation.

For more details circle 146 on Enclosed Return Postal Card.

GENERAL ELECTRIC COMMUNICATIONS PRODUCTS DEPARTMENT, Electronics Park, Syracuse, N. Y., has published a 38-page brochure (ECR-497) on 2-way mobile radio equipment. It shows the wide range of equipment designed to fit individual needs based on present FCC rulings. It also tells how today's units are being engineered with future needs and FCC policies in mind.

For more details circle 147 on Enclosed Return Postal Card.

SPECIFICATIONS FOR MUNICIPAL COMMUNICATIONS CONTROL SIGNAL AND POWER CABLES was recently published by Kaiser Aluminum and Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Ill. This new 208-page edition, known as the "Red Book" of the International Municipal Signal Association, includes the latest specifications for police communications and traffic and fire alarm systems. In addition, Kaiser-approved specifications are given for 300-volt Laytex braided cables, 600-volt Laytex resin cables of the I.M.S.A. type and 300-volt Laytex resin cables. The book may be obtained free from R. H. Turner, electrical conductor division.

For more details circle 148 on Enclosed Return Postal Card.

AXLES AND RUNNING GEAR and many special details are covered in the new 34-page illustrated catalog of the United Manufacturing Co., 5250 Dobeckmun Ave., Cleveland 2, Ohio. It is stated this is the only catalog complete with engineering drawings and military and commercial specifications.

For more details circle 149 on Enclosed Return Postal Card.

PROGRESS THROUGH RESEARCH AT AIR REDUCTION is the title of a 28-page booklet detailing the research and development work of Air Reduction Company, Inc., Murray Hill, N. J. The company was originally formed to produce oxygen for oxyacetylene welding and has since expanded its activities to cover research in three major fields: chemistry, welding and metallurgy, and engineering development.

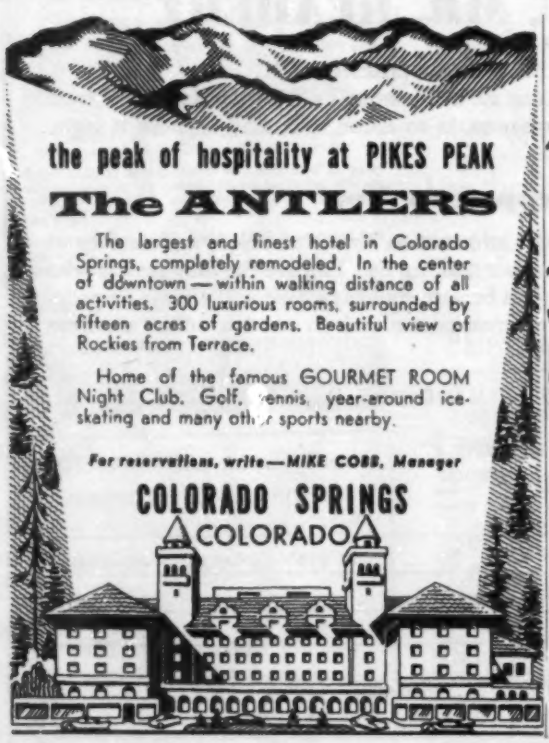
For more details circle 150 on Enclosed Return Postal Card.

MAINTENANCE GUIDE, (Form No. 32395), available from Advertising Division, Caterpillar Tractor Co., Peoria, Ill., is a new 24-page publication prepared as an aid to operator of Cat D7, D8 and D tractors. It contains more than 75 full color drawings of helpful hints for obtaining optimum service life from Caterpillar-built equipment. Written in narrative form, it tells how one tractor owner learned to keep his machine on the job with lower maintenance costs.

For more details circle 151 on Enclosed Return Postal Card.

TRACTOR SERVICE BULLETIN, an 8-page publication (FT 57) covering Ford tractor models 600, 700, 800 and 900, available from Owatonna Tool Co., 474 Cedar St., Owatonna, Minn. It graphically illustrates step-by-step operations for various tough jobs using specially designed OTC hydraulic and manual tools.

For more details circle 152 on Enclosed Return Postal Card.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The ANTLERS
The largest and finest hotel in Colorado Springs, completely remodeled. In the center of downtown — within walking distance of all activities. 300 luxurious rooms, surrounded by fifteen acres of gardens. Beautiful view of Rockies from Terrace.
Home of the famous GOURMET ROOM Night Club. Golf, tennis, year-around ice-skating and many other sports nearby.
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COLORADO SPRINGS
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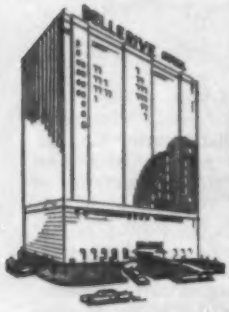

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You can be assured of comfortable accommodations in Kansas City, by writing for your FREE "Preferred Guest Card" from the Bellerive Hotel, today. The Bellerive—preferred by the family, and business executives for convenience and courteous hospitality at sensible rates—guarantees (with advance notice) reservations anytime of the year to you, the preferred guest. Ask for your "Preferred Guest Card", today . . . at no obligation. Free Radio & Television set in every Room. Rates from $4.50

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20 S. Dearborn Street

With The Manufacturers And Distributors

TIMBER ENGINEERING COMPANY, Washington, D. C. is celebrating its 25th year of research and engineering in the lumber and wood products industries, according to an announcement by Harry G. Uhl, president.

ATLAS POWDER CO., Wilmington, Del., has named Eugene F. Daily to be western construction manager for the company's explosive sales department with headquarters in San Francisco. The new post will make it possible, it was said, for western contractors to consult more frequently with Atlas representatives on explosives for all types of heavy construction.

E. PAUL MONROE, president of Hercules Galion Products, Inc., Galion, Ohio, this year celebrates his golden anniversary with the company. Long active in the truck equipment business, he is widely known as a pioneer in the field.

CLESSIE L. CUMMINS has retired as honorary chairman of the board and a director of Cummins Engine Company, Inc., Columbus, Ind. Cummins, 68, founded the company in 1919 and was its president from 1919 to 1947, chairman of the board from 1947 to 1951, and honorary chairman from that date. In 1943 he served as director of diesel production of the War Production Board.

HELTZEL AND LEAP join in manufacture of prestressed forms. The Heltzel Steel Form & Iron Co., Warren, Ohio, manufacturers of steel forms for concrete shaping, has joined with Leap, Inc., design firm of Lakeland, Fla., to produce a complete line of forms and accessories for the manufacture of prestressed concrete products.

WHAT ABOUT YOU, MR. READER?

Are you still active in the field? Have you moved or changed your position?
Unless you send this information directly to us we can't be sure. Sometimes a reader's name is cut from the mailing list because we are not sure that our information as to name, title and address is right. *Your* name might be cut from the mailing list.

Don't Let This Happen to You

Even if you think we know all about you, please fill in the information requested below and send to us by return mail. Our auditors require proof of accuracy of our mailing list. *You* are the only person who can help us on this. Do it now before you forget, so you can be sure your magazine will always be properly addressed to you. New names cannot be added or old names retained on our list unless we have *all* this information. *Please print or type.*

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☐ I do receive ROADS & STREETS and wish to continue to receive it.
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SIGNATURE _____

ENGINEERS — FOREMEN — OFFICE MEN
Learn latest methods to organize and run work. Prepare for the top jobs. Send post card for details.
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CONSTRUCTION CONSULTANTS
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GRADING & CONCRETE PAVING EQUIPMENT

1—D-8 Cat tractor w/angle blade & DDP unit, S/N 2U5173	$10,000.00
1—D-8 Cat tractor w/angle blade & DDP unit, S/N 1H8690	7,000.00
1—D-8 Cat tractor w/push plate & DDP unit, S/N 1H6122	7,000.00
1—D-7 Cat tractor w/push plate & DDP unit, S/N 7M4127	5,000.00
1—Scraper, GarWood 25 cubic yard, S/N 5231	5,500.00
1—Slusser McLean, Heavy Duty three tooth Ripper, S/N 271	1,000.00
1—10 Ton Buffalo-Springfield Roller, S/N 18680, w/Waukesha gas engine, perfect condition	3,500.00
1—Air Compressor, Gardner-Denver, 210 ft., Cat diesel engine	
1—Air Compressor, Worthington, 105 ft., Waukesha gas engine	
1—Master Vibrator - Electric	200.00
New D-7 and D-8 Bottom Rollers - 80% New Price.	
1—Gardner-Denver Wagon Drill	1,000.00
1—Buda Hornden Earth Drill, with 18" auger, will dig 10' deep hole	1,500.00
1—Backhoe Stick for 255A P & H Backhoe - New	500.00

All this equipment in extra good condition and ready to do a job. Should be inspected to be appreciated. All this equipment is subject to prior sale. Contact us for prices on any not priced.

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Construction and railroad equipment.

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FOR SALE: One cu. yd. Wagner Mixermobile used very little. Has standard tower plus 10 ft. extension and chute. Very reasonable.

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FOR SALE
BOTTOM DUMP EUCLIDS

4—17 Yd. Euclids @ ..... $13,500 Each
11—13 Yd. Euclids @ ..... $ 9,500 Each
1—¾ Yd. Shovel front for Model 41 Lorain

All this equipment in excellent operating condition and can be seen at work in South Alabama.

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60 in.	9.80
90 in.	9.65
120 in.	9.50
180 in.	9.25
360 in.	9.00

COPY AND CLOSING DATES Final closing date is the Fifteenth of the preceding month. Magazine is issued 1st of publication month. If proof is desired, copy must be received 5 days preceding closing date.

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ROADS AND STREETS
22 W. MAPLE STREET, CHICAGO 10, ILL.

Please Insert the Attached Advertising Copy in the Next Issue of ROADS AND STREETS to Occupy.....Inches of Space.

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COMPANY.....

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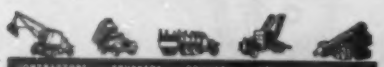

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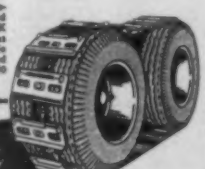

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Block, ordinary, for manila rope, regular duty, steel shell, japanned, button head pin with cotter, selflubricating, bronze bushing, hook, swivel, loose and plain bottom, japanned 7 in. shell, 1 in. rope. $4.25 value for $1.85 ea. In lots of 25 or more, $1.50 ea.

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Sale Price: $26,100.00

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Sale Price: $31,200.00

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Serial Nos. 2606 & 2515. Both purchased new 2-14-57. Excellent throughout. Each used approximately 1,300 hours.

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